



***Sleep Bruxism,  
Sleep Apnea and Orofacial Pain***

**2017**

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**Grants:** CIHR, FRQS, CFI, Canada Research Chair

**Disclosure:**  
***Neither I nor my immediate family have any financial interests that would create a conflict of interest or restrict my independent judgment with regard to the content of this course.***

**Other Relations :**

- **Grants/Research Support:** CRC, CIHR, FRQS
- **Speakers Bureau/Honoraria:** Lectures to Dental Study Group or Societies
- **Other:** Past president of Canadian Pain Society
- **Book:** Quintessence – DSM 2009
- **Free use of oral appliances and recording systems (e.g., Narval/Resmed & Somnomed; Braebon, Bruxoff, Night Shift)**

**Gilles Lavigne, DMD, PhD, FRCD**  
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Centre Étude sur le Sommeil, Hôp du Sacré Coeur de Montréal

**Traditional dental training is based on the medical surgery model: DDS till the 1970'ies, now DMD's**

**-1960 to 1990: Linear model = hypothesis driven to explain cause and effect**

**-1990-2015: Evidence based medicine = Randomized clinical trial & CLASSIFICATION & GUIDELINES**

**NOW: from data mining, clustering and DEEP LEARNING, we can GENERATE hypothesis = PRECISION MEDICINE**

**Then dentists face uncertainty and ambiguity in diagnosis and treatment CHOICES (P Edwards, OOOO March 2017)**

**Where are we for BRUXISM (wake and/or sleep):**

**In dentistry bruxism was for years seen as a dental wear condition due to one cause – interferences in occlusion**

**In psychology as a stress related condition to poor coping skill – now a behavior?**

**In medicine it went from contagious behavior to tic to psychosomatic and neurological condition to an autonomic- hypervigilance state intruding in sleep... a disorder in some small % of person?**

**Integrated vision may be needed**

<p><b>Fiction</b> <b>Reality</b> (not open every winters) <b>Ice bridge depend on:</b> <i>Business need, unsalted water, <b>deep cold</b>, no major current and a contractor to maintain</i></p>	<p><b>Ice bridge from Paladinaz</b></p> 
	<p><b>TAKE HOME:</b> <b>Many factors</b> <b>How to decrypt</b></p> <p><b>Ice bridge</b> (Photography from Montreal Gazette) between Hudson and Oka, Qc</p>

**For snoring:**

**In dentistry, when a patient was complaining of snoring, he (it was mostly male) was told to use of **tennis ball on pajamas...****

**Physician had no clear answer either...**

**Apnea was not yet on the radar before the nineties!**

## A near change in Dx and Tx of SDB to be expected?

Increased training for generalist clinicians, including **non-physicians**, in the **diagnosis** and **chronic management** of **symptomatic, uncomplicated high pretest probability OSA**, similar to the approach currently implemented for other chronic medical conditions such as COPD or asthma.

See: **What is the Future of Sleep Medicine in the US?**

Phillips B et al

AJRCCM, in Press, 2016

## **A near change in Dx and Tx of SDB to be expected?**

*With a high pretest risk for OSA but low test outcomes (AHI <5) were twice as likely to be female*

and approximately 20% to 30%

**more likely to report a history of :**

**insomnia, lung disease, and/or stroke**

From GL: **WE CANNOT GO ALONE,**  
**MD collaboration mandatory**

See: **Who is getting tested for obstructive sleep apnea using a portable recording system? Test results from 193,221 patients.**

See: Cairns A et al, J Clin Sleep Med, 2014 (ARES questionnaire)

## Role(s) of dentistry in sleep medicine:

**Green light: sleep bruxism= Dental Expertise recognition, diagnosis and management**

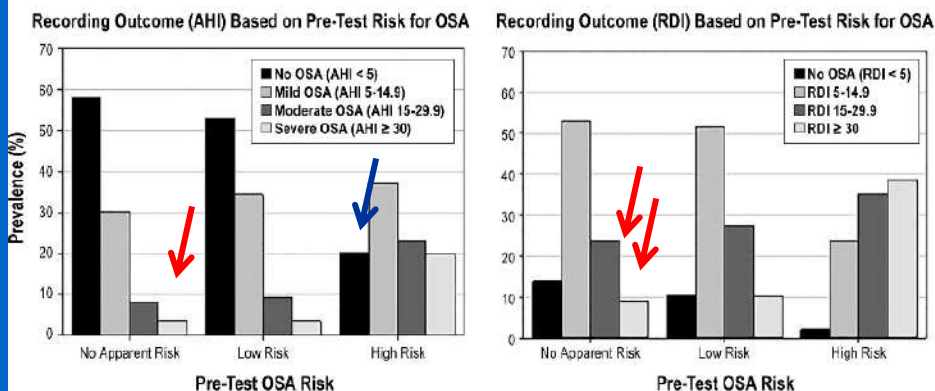
**Yellow light: sleep bruxism in presence of other sleep disorders and pain = COLLABORATION + referrals Recognition and management with MD's**

**Red light: sleep apnea, insomnia, GERD= MD Expertise and responsibility  
DMD= recognition ++ // not diagnosis  
We collaborate to deliver management**

**Pretest negative in 10 to 30% (AHI & RDI) of Moderate to Severe OSA and scored HIGH RISK without AHI -- Cairns A et al J Clin Sleep Med 2014**

Journal of Clinical Sleep Medicine  
Official Publication of the American Academy of Sleep Medicine

Bar graph showing ARES portable recording outcomes (AHI and RDI severity) based on pretest risk and severity for OSA using the ARES Screener Questionnaire.



**For Sleep Disordered Breathing  
(apnea)**

**AHI and RDI are not explaining  
all risks & conditions...**

**Sleep hypoxia (low O<sub>2</sub>) seem to  
be more critical**

**Role of sleep fragmentation is  
*DEBATED* (++) *pain, depression??*)**

**Think COMORBIDITIES:  
hypertension, diabetes, depression, etc**

**SCREEN for Fatigue ++ and Sleepiness**

**Why and how we sleep**

M Heughebaert, Lac Léman, CH

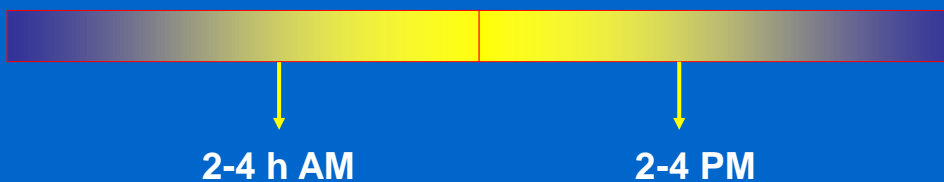
## 1- SLEEP and its Roles

- Recovery from fatigue
- Re-energizer:
  - Brain - role of deep (St 3&4) sleep
  - Heart - metabolic reset**
- Immune protection?
- Memory consolidation
- Dreams and well being (we dream in all sleep stages / REM dreams are more vivid) REM: Rapid Eye Movement



## Sleep pressure

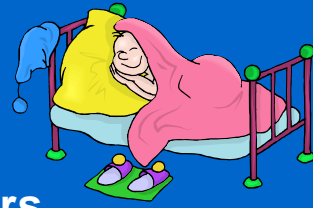
- Sleep pressure reach it max 2 times / 24 hrs



Or before if **sleep are sleep deprived**,  
if large meal and alcohol



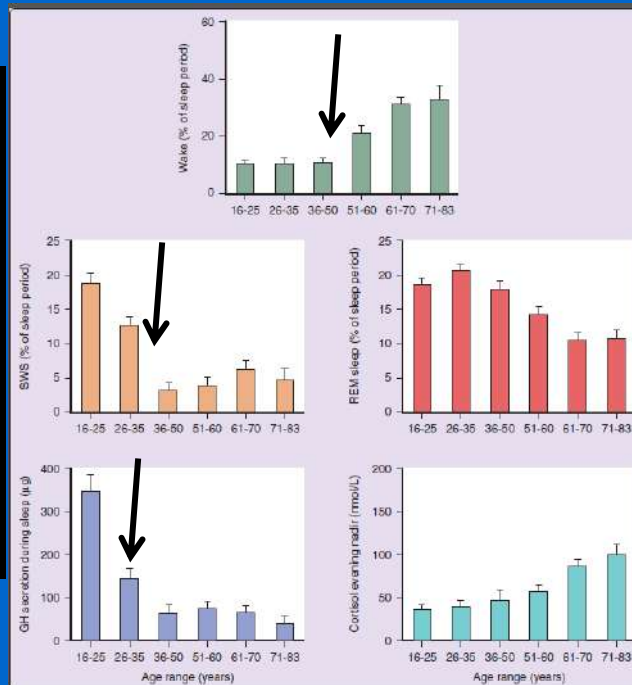
## Normal Sleep



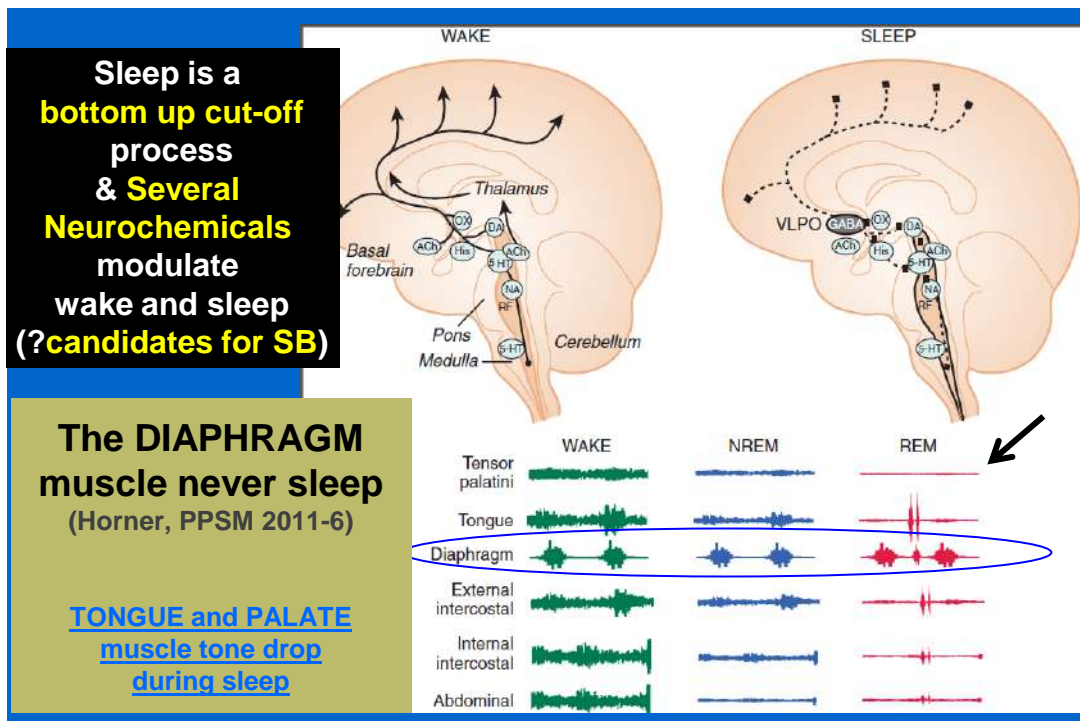
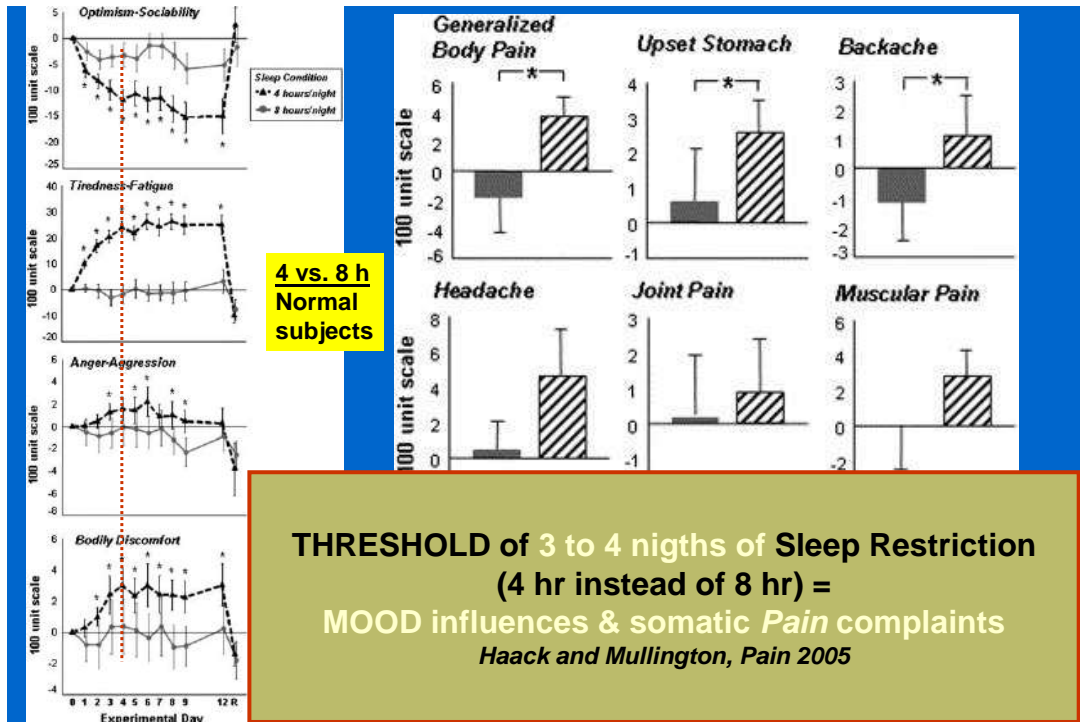
<b>Baby</b>	: $\approx$ 16 to 18 hours
<b>Child</b> before 14 yo	: more than 9 hours
<b>Teenager</b>	: variable duration / deprivation and recovery under mood influences
<b>Adult</b>	: $\approx$ 7 to 9 hours
<b>&gt; 70 years old</b>	: $\approx$ 7 hours with <b>NAPs-siesta</b>

## Changes in sleep variables with aging: Decrease in Slow wave sleep Growth hormone

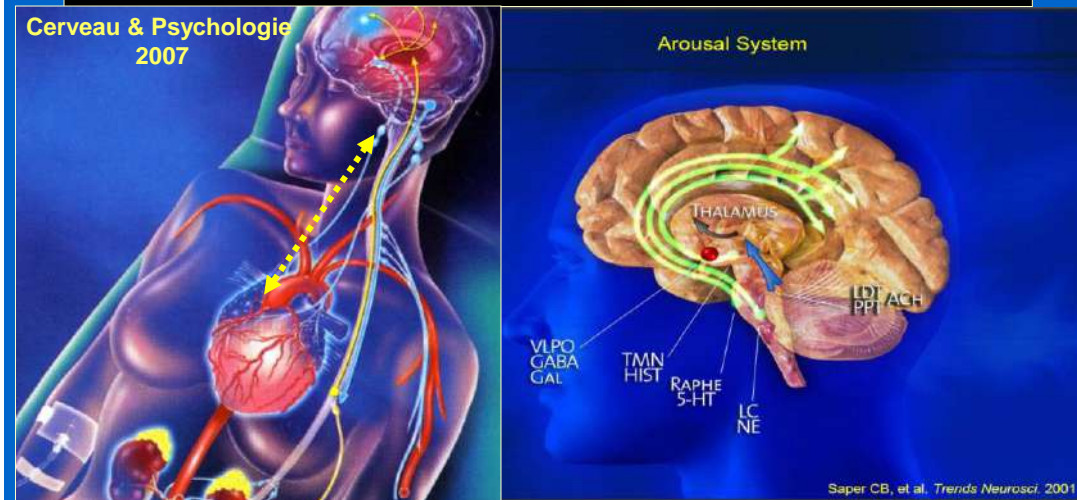
van Cauter et al  
PPSM 2016,  
Kryger et al eds,  
Elsevier







**AROUSAL during sleep** = Transient activation  
(3-15 sec/ 7 to 14 times per hr) of brain,  
muscle and heart + respiratory system



## Sleep Bruxism





## 1- Sleep Bruxism – definition, prevalence, screening....

**Definition :** from parafunction and parasomnia  
(ICSD 1 / Am Acad Sleep Med)

- ICSD 2 and 3 (2014): **Movement Disorder**
- **Revisited** (Lobbezoo et al, Journal of Oral Rehabilitation 2013 and ICSD 3)

Repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by **bracing or thrusting** of the mandible.

Two distinct **circadian** manifestations: sleep (indicated as **sleep bruxism**) or wakefulness (indicated as **awake bruxism**).

**Is it a tic, a habit?** Wake.... Chewing gum, bracing...

## **What is Bruxism?**

An open and ongoing debate for years

*An oral activity (clenching and grinding)  
that can occur, in some person,  
during WAKE and SLEEP...*

### **Spectrum – not a continuum?**

- A usual oral motor activity in reaction to life...
- Or an oral behavior?

### **- Or a disorder?**

(signs & symptoms, presence of risk factors,  
co morbidities, etc) // (small % of population)

Lets revisit the Int Class Sleep disorders 3 (2015)

### **SYNDROME to DISORDER:**

*Restless Leg Syndrome / Periodic Limb Movement  
RLS / **wake** to PLMS and PLMD / **sleep***

**Sleep related movement disorders are  
primarily characterized by:**

*relatively simple, usually stereotyped,  
movements that disturb sleep or its onset.*

Lets revisit the Int Class Sleep disorders 3 (2015)

**SYNDROME to DISORDER:**

***RLS/ wake to PLMS and PLMD / sleep***

***Then having PLM in sleep is not enough to be Dx as a Disorder...***

**Nocturnal sleep disturbance or complaints of daytime sleepiness or fatigue are a prerequisite for a diagnosis of a sleep related movement disorder**

Lets revisit the Int Class Sleep disorders 3 (2015)

**SYNDROME to DISORDER:**

***RLS/ wake to PLMS and PLMD / sleep***

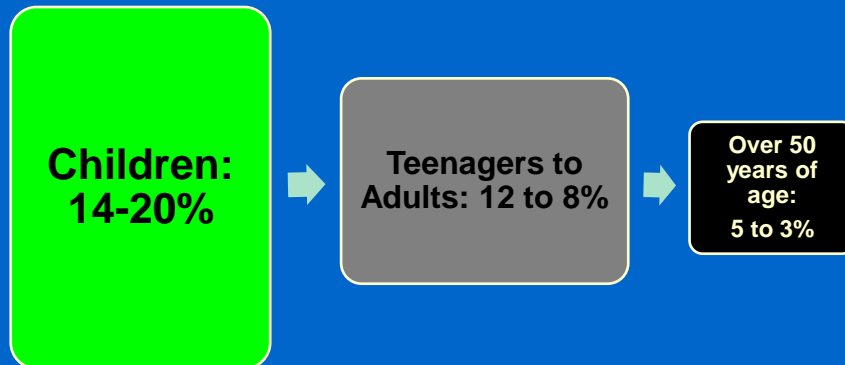
***Then having PLM in sleep is not enough to be Dx as a Disorder...***

**Nocturnal sleep disturbance or complaints of daytime sleepiness or fatigue are a prerequisite for a diagnosis of a sleep related movement disorder**

***We have to see where fits sleep bruxism:  
frequency, impact on health and quality of life,  
co morbidities, etc...***

**Evidence needed – with Systematic review or Meta  
Analysis consensus**

## Summary of Tooth Grinding Prevalence based on Self Reports or Parents or Sleep Partner Awareness (not always precise)



Mayer, Heinzer and Lavigne, CHEST 2016

### Assess presence of some markers

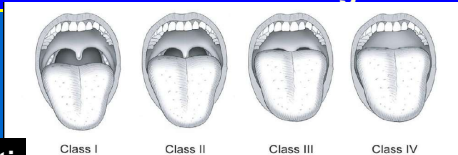
- Positive **sound** report from sleep partner (grinding, tooth tapping), Tooth Wear, Pain and Headache
- **CHILD**: Enuresis, morning headache, school performance / deficit of attention, etc
- **COMORBIDITY** (apnea...??):

Snoring /cessation breathing /choking);

Class 2- **retrognathia** (45% pop);

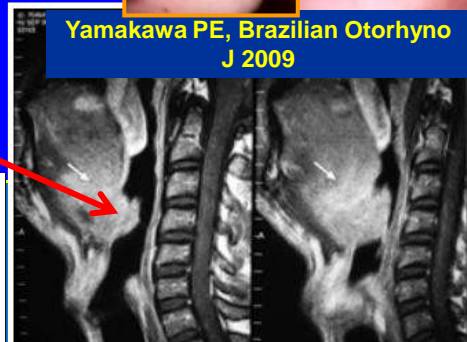
**Deep palate** (ogival shape);

**Large tonsils – adenoids OR tongue**



Mallampati

Figure 1





## Criteria suggested to screen patients with SB

(Int Class Sleep Disor 3 - 2014)

1. A **recent history of tooth grinding sounds occurring at least 3-5 nights per week** over 6 months (if sleep alone???)

**Debated...**

2. Presence of **tooth wear** :

it is a YES or NO

- NOT for current or severity assessments

AND no difference in EMG measures

(Abe S et al, Int J Prosthodont 2009; Jongsang C et al, J Dent 2015)



**NB: not reliable** since can be past SB episodes

?? Masseter **muscle hypertrophy**: due to  
CLENCHING alone and/or chewing gum, tic, etc?

## Criteria suggested to screen patients with SB

(Int Class Sleep Disor 3 - 2014)

- 3- **Muscle FATIGUE, & temporal HEADACHE =**  
**Morning masticatory muscle pain:**

- Rompré et al, J Dent Res 2007, **Montreal**;
- Schmitter et al, Sleep Med 2015, **Germany**;
- Palinkas M et al, J Clin Sleep Med 2015, **Brazil**:

**High sensitivity ??** (78% & 67%; OR 9.6 & 9.2)/

**Debated: see Raphael K note, JCSM, 2016**

- Stuginski-Barbosa J et al, J Prosthodont 2016, Brazil;  
**The report of regular or frequent SB (4X/week) and the presence of (1) incident of abnormal tooth wear or (2) incidents of transient morning jaw muscle pain or fatigue : best discriminatory items of ICSD-3 for SB diagnosis.**

## 2- Diagnostic (Dx) tools

### For RESEARCH

### RMMA EMG index (/hr sleep):

*Rhythmic Masticatory Muscle Activity*

2- 4 low frequency

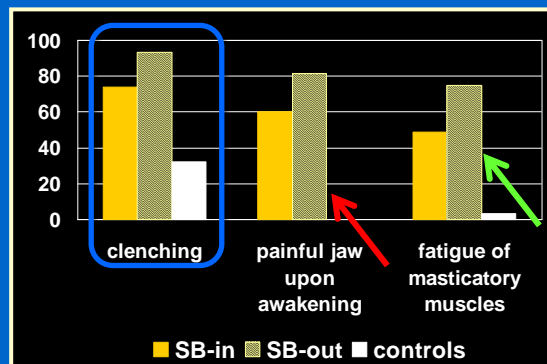
4 and more: modest to high frequency

## Wake and Sleep Bruxism OVERLAP

### Threshold from normal to Dx

Phenotype – sub-group of SB (Rompre, J Dent Res, 2007)

- **OVERLAP:**  
WAKE clenching in over 90% of occasional sleep bruxism cases
- LOW FREQUENCY of RMMA Episodes /hr of sleep : 70% had **MORNING PAIN**



- Low FREQUENCY of RMMA Episodes /hr in SB patients
- BELOW 4 RMMA/hr



## Type 2: Portable (ambulatory) full PSG Compumedic, Embla (Natus), etc



**Sleep (PSG) Systems**

- Laboratory
- Portable

**Neurology (EEG) Systems**

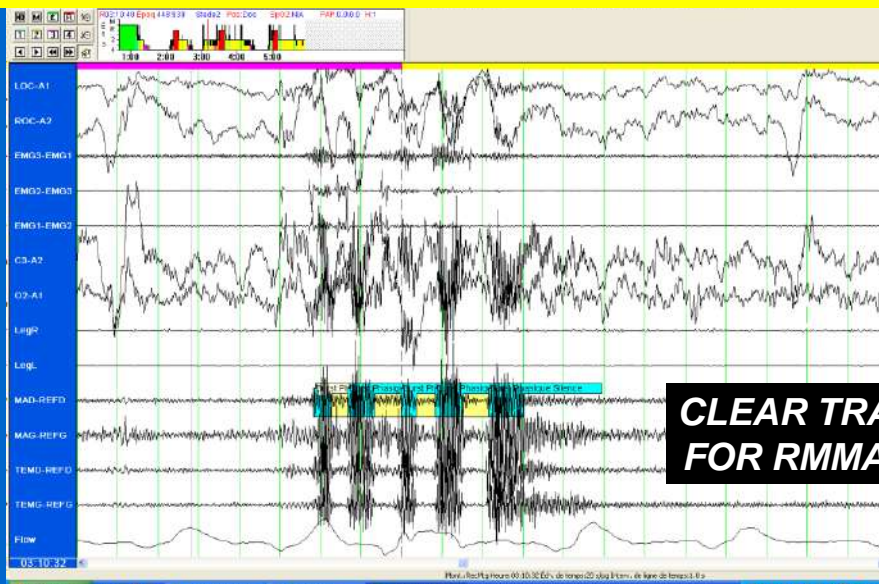
- Laboratory
- Ambulatory

**Siesta**  
Revolutionary Diagnostics for a Wireless World

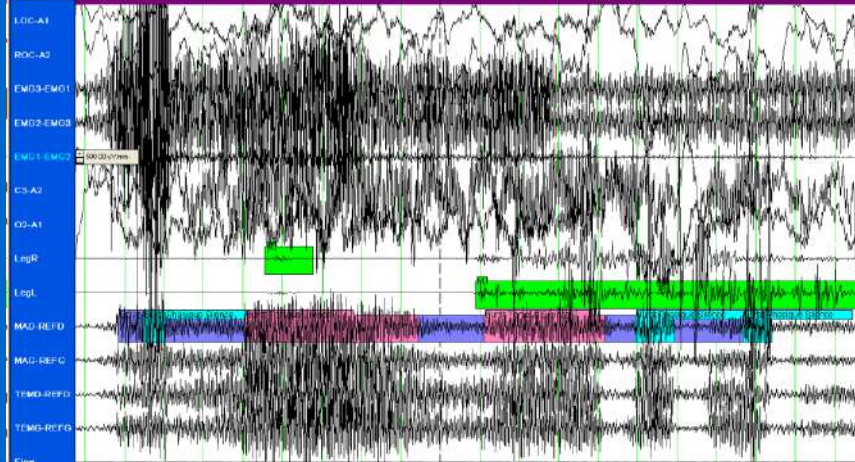
**Overview**  
The Siesta System is a new wireless, multi-functional, ambulatory recording device. It enables recording, monitoring, storage and transfer of up to 32 physiological data inputs, such as brain, heart and muscle activity. In addition it has an Oximeter interface for heart rate and oxygen saturation as well as supporting up to 32 external DC signal inputs for recording the output of other devices such as pH meters.



## SB EMG recordings to score RMMA



## Portable PSG not easy to score without video



**Carra MC 2014 – Comparison of RMMA- SB with and without video scoring. RMMA overestimated by 23.8% without VIDEO**  
Also underestimate for Orofacial activities

## TYPE 2-3: Screening- Monitoring (ambulatory) Few channels: breathing, EMG-RMMA/brux...

**BRAEBON**  
For Today's Business of Sleep™

PRODUCTS  
SOLUTIONS  
SUPPORT  
ABOUT US

**MEDIBYTE®**

Ultra Sensors  
PureFlow  
Disposable Airflow  
MediByte  
Features  
Tech Specs

**It's that small**

The world's smallest level 3 recorder packs the quality of a sleep laboratory in the palm of your hand! The MediByte is just 2.5 x 2.25 x 0.75 inches (66 x 60 x 19mm) and weighs in at just 3.5 ounces (99g).

**SLEEP PROFILER PSG 2™**

Step 1: Wear  
Step 2: Sleep  
Step 3: Export

The NOX-T3 portable sleep monitor maximizes patient comfort and clinical value.



## Type IV: Sleep bruxism, one channel / Monitoring and Tx

**GrindCare- SUNSTAR is now the owner**  
(see publications from P Svensson)

**NOTE: In absence of audio-video= 24 % overestimation.**  
Carra, MC et al in Sleep and Breathing 2014



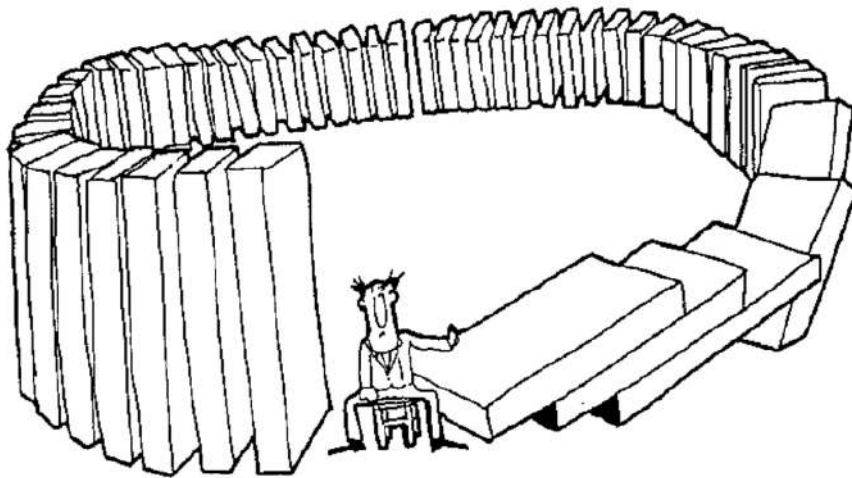


### **3- WHAT TRIGGERS SB?**

#### **Genesis - mechanism**

Photography:  
Marlyse HEUGHEBAERT,  
Switzerland

**In complex systems, cause and effect  
are often distant in time and space**



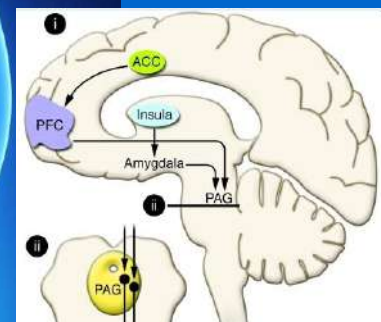
## Psychophysiological aspects: debated

*Role of life pressure ???*

- In a large population (n = 100), psychosocial stress during wakefulness does not seem to influence masticatory EMG during sleep (Pierce 1995): **Role of anxiety (coping style), personality ?**
- In a cross-sectional telephone survey, patients reporting tooth grinding during sleep were found “**DMS-IV anxiety disorder**” with a low odds ratio:1.3 (Ohayon 2001)
- **NOT A PSYCHIATRIC CONDITION**



## Putative role of Amygdala (emotional control) in genesis-onset of SB under investigation (animal data: Mascaro MB, Eur J Oral Sci 2009)

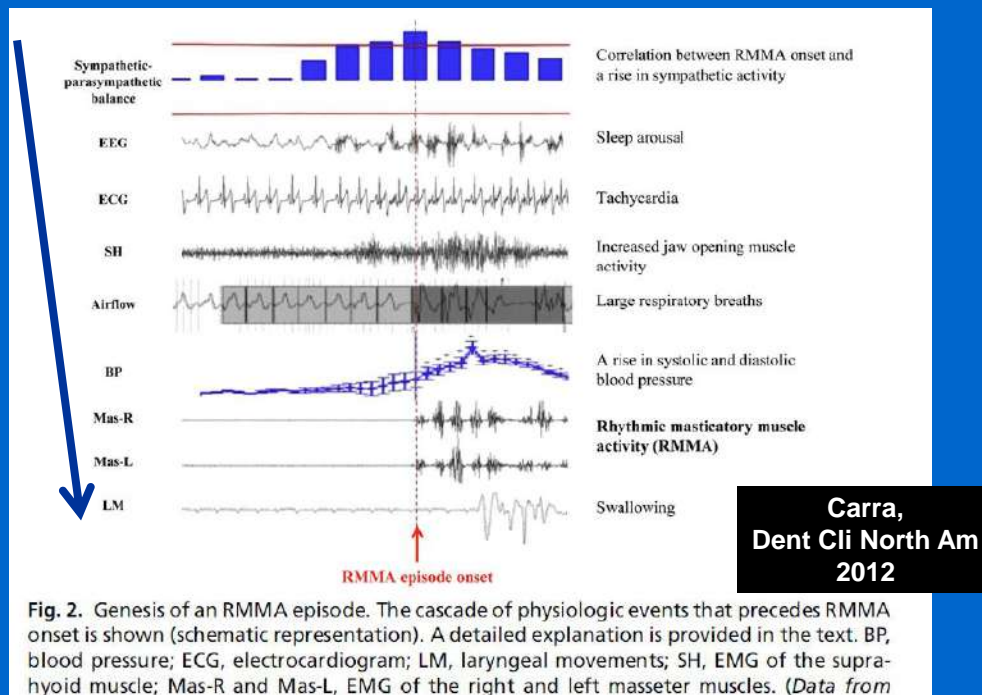
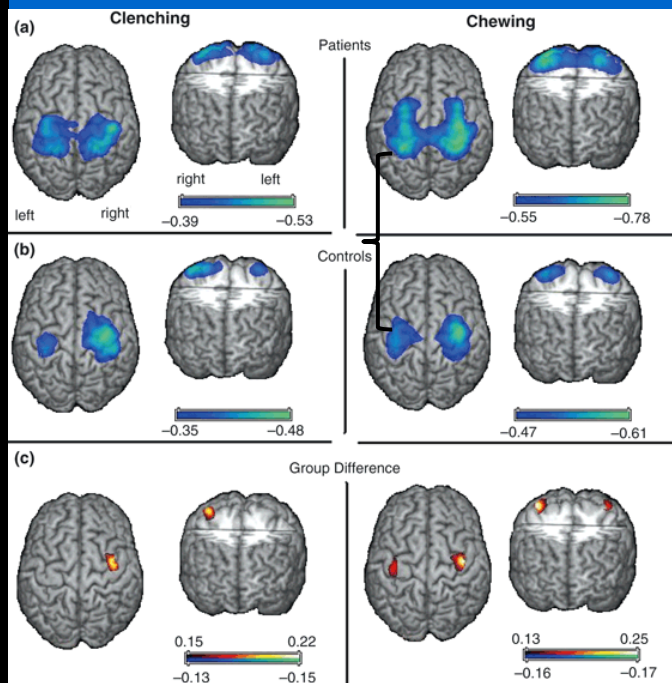


Schweinhardt P, Bushnell MC.  
J Clin Investigation 2010

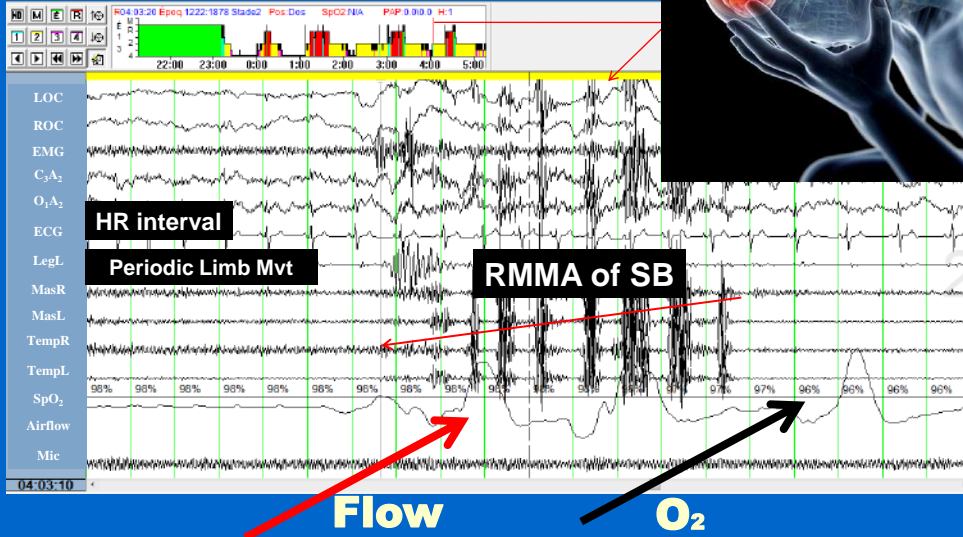
## Learned activity/ Brain plasticity/ adaptive state

Patients with SB =  
larger cortical activation  
(MEG mapping) when  
they execute a  
**VOLUNTARY** clenching  
or chewing  
motor task during  
**WAKE Time**

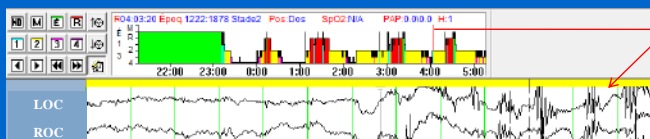
Kervancioglu BB et al  
J Sleep Res 2012



## Central Nervous System and SB: Brainstem to Cortex if AROUSAL



## Central Nervous System and SB: Brainstem to Cortex if AROUSAL



**RMMA with Autonomic & EEG arousal**

**NO EXPLAINING ALL RMMA ONSET**

- Concomitant in young and healthy person: 80% Lavigne lab
- Less in general population: 50% Maluly 2013

## 4- SB Differential Dx

### Primary-idiopathic form

vs.

### Secondary to....



### Sleep Related

- Snoring
- Sleep Disorder Breathing
- Periodic Limb Movement
- RBD (REM Behavior Disorder)
- Sleep Epilepsy
- Sleep Gastro esophageal Reflux
- Sleep Walking,
- Sleep Talking, Sleep Enuresis ( triad with Sleep Bruxism in children)

### Oral and Dental

- Sleep Tooth Tapping: Mostly Idiopathic but Exclude Sleep Epilepsy or RBD
- Sleep Tooth Grinding = Sleep Bruxism / Primary or Secondary
- Wake time Nail and Object Biting: Tic or Habit
- Wake time Tooth Clenching: Reactive Tic or Habit
- Large Tonsil/Adenoids

### Others (wake and/or sleep)

- Headache
- Temporomandibular Disorders/ Orofacial Pain
- Allergies
- Attention Deficit Hyperactive Disorder
- Mood: Anxiety and possibly Depression
- Addiction
- Parkinson, Oromandibular Dystonia-Dyskinesia



**General Sleep Lab population (n=1042)**  
**No association with DEPRESSION, OSAS, SNORING**  
**but YES with INSOMNIA (Maluly, J Dent Res 2013)**

		No Bruxism		Bruxism		Total N	$\chi^2$	p
		N	% (CI 95%)	N	% (CI 95%)			
OSAS	No OSAS	389	91.2 (85.8-93.6)	38	8.8 (6.4-14.2)	427	0	.93
	OSAS	180	91.0 (84.1-94.0)	18	9.0 (5.9-16.0)	198		
Snoring	No snoring	328	91.8 (89.0-95.5)	29	8.2 (4.5-11.0)	357	0.7	.39
	Snoring (3x or more/wk)	241	90.0 (81.1-92.1)	27	10.0 (7.9-18.9)	268		
RLS	No RLS	441	90.7 (86.5-93.2)	42	9.3 (6.8-13.5)	483	3.0	.38
	RLS	101	88.5 (60.8-97.6)	13	11.5 (2.4-39.2)	114		
Insomnia	No insomnia	508	92.0 (87.2-94.5)	44	8.0 (5.5-12.8)	552	5.6	.01
	Insomnia	61	83.5 (93.6-82.9)	12	16.5 (6.4-17.1)	73		
Anxiety	No anxiety	482	92.6 (90.1-95.1)	38	7.4 (4.9-9.9)	520	1.1	.28
	Anxiety	37	88.0 (69.7-94.3)	5	12.0 (5.7-30.3)	42		
Depression	No depression	468	92.6 (90.0-94.7)	37	7.4 (5.3-10.0)	505	1.0	.30
	Depression	47	88.6 (78.5-96.2)	6	11.4 (3.8-21.5)	53		

OSAS = Obstructive Sleep Apnea Syndrome; RLS = Restless Legs Syndrome.

## Differential Dx of Sleep Disorders

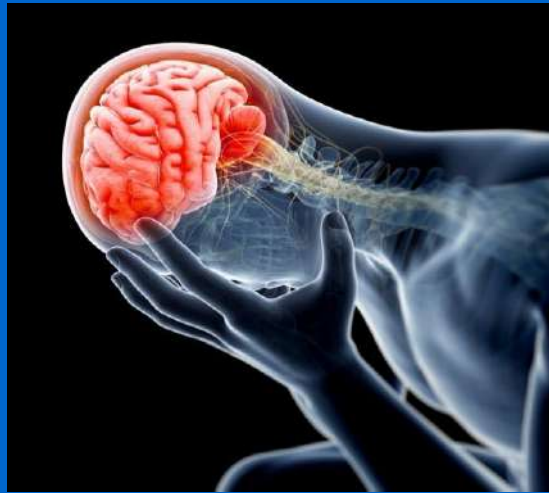
### **Insomnia** (e.g. idiopathic, psychophysiological):

- Difficulty to fall asleep or maintain sleep if waking.
- Sleep onset more than 20-30 Min.
- Symptoms: in 30% of population
- Syndrome: 7% new onset and persist in **3.9%** at one year  
 (LeBlanc, M SLEEP 2009; Jarrin DC, J Sleep Res 2014)

**Difficulties maintaining sleep REPORTED by 47.8% of tooth grinding/SB person in general population** (self report awareness) – Khoury et al, SLEEP 2016

**NOT in young SB subjects....** Our physiological studies in Montreal

## Neurological conditions = secondary SB



Differential Dx critical - SECONDARY SB

### Concomitant Neurological sleep disorders:

- **Oromandibular myoclonus/tooth tapping** in 10% of Sleep Bruxism subjects (Kato T, 1999):

- **Epilepsy** (Vetrugno R 2002); rare but important....

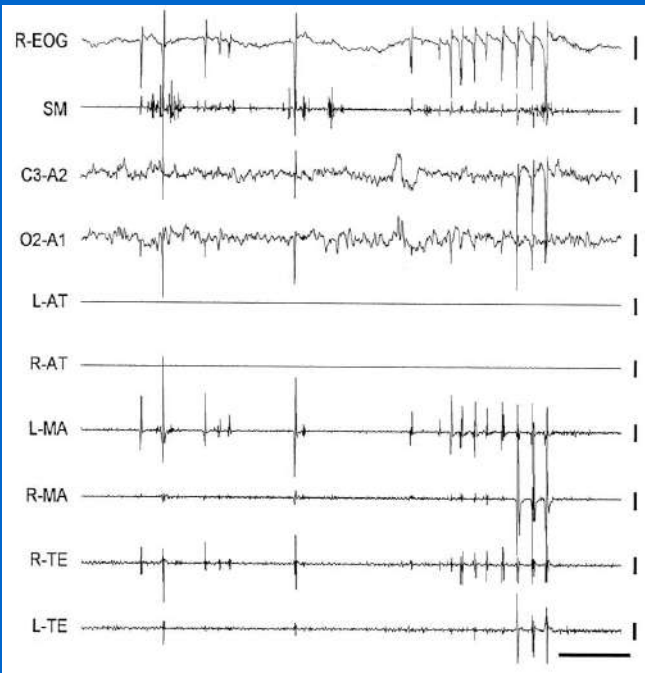
- Parkinson's, Huntingtons, Oromandibular dystonia or Neuroleptic induced dyskinesia.....

## Tooth Tapping

= Sleep  
oromandibular or  
orofacial **myoclonus**  
(found in 10% of SB  
patients)

**Important to  
EXCLUDE  
SLEEP  
EPILEPSY**

(Kato T et al, Mov  
Disorders 1999;  
Vetrugno R et al, Familial  
nocturnal facio-  
mandibular myoclonus  
mimicking sleep bruxism.  
Neurology 2002)



Differential Dx critical - **SECONDARY SB**

**Concomitant Neurological sleep disorders:**

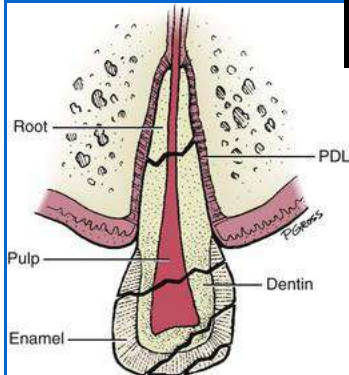
**Oromandibular myoclonus/tooth tapping in 10% of Sleep  
bruxism subjects (Kato T, 1999):**

**-REM behaviour disorder** (Sleep bruxism and  
mainly Oromandibular Myoclonus found in RBD  
subjects; Abe, Sleep Med 2013) ....

**UNKNOWN IF LINKED TO:**

**RISK of developing Parkinson Disease, Multiple  
System Atrophy, Dementia = 30% at 3 y & 66%  
at 7.5 y (Postuma RB, Neurology 2015)**

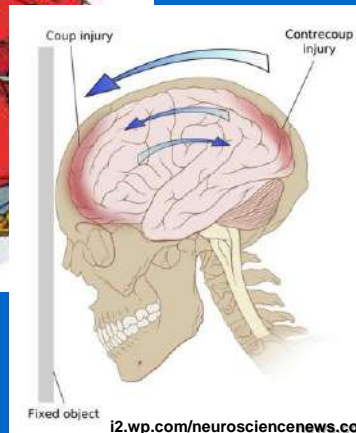
## TBI (Traumatic Brain Injury) Dentist see tooth damage but is it the only damage?



<http://pocketdentistry.com/15-introduction-to-dental-trauma-managing-traumatic-injuries-in-the-primary-dentition/#s0105>



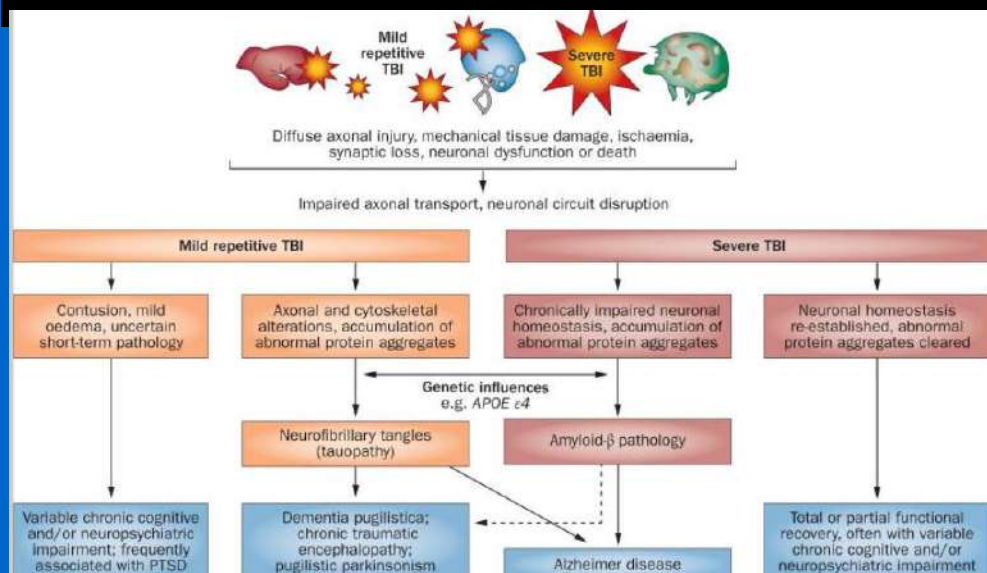
<http://minnesotahockeymag.com/wp-content/uploads/2012/12/Concus1.jpg>



[i2.wp.com/neurosciencenews.com](http://i2.wp.com/neurosciencenews.com)

## TBI Putative Consequences (Sport Injury Model)

DeKosky ST et al, NEJM 2010 and Nature Rev Neuro 2013



## mTBI and SLEEP PROBLEMS

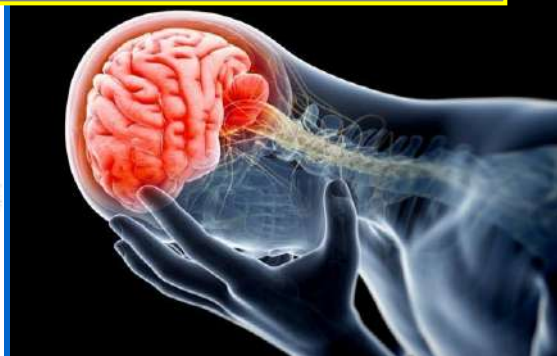
Castriotta RJ, 2011, 2007

- **Insomnia and Circadian Sleep-Wake Rhythm disturbance: 50%**
- **Sleep Apnea: 23% (CPAP)**
- **Post trauma Hypersomnia: 3-11%**
- **Narcolepsy: 5-6% (modafinil Rx)**
- **Periodic Limb Movement during sleep: 7%**

Verma 2007

- **Hypersomnia (apnea, narcolepsy, PLM): 50%**
- **Parasomnia/ REM Behavior Disorder: 25%**

## Traumatic Brain Injury (mTBI)- (Concussion)



Biennial Review of Pain

**PAIN** 2015

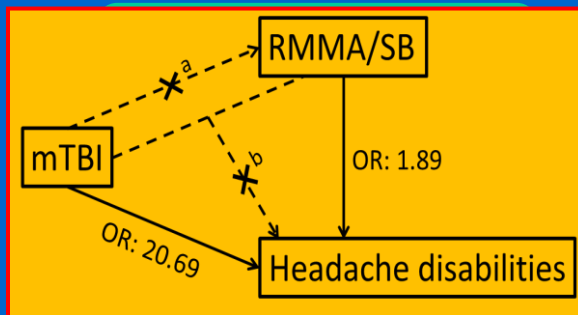
### Pain and sleep in post-concussion/mild traumatic brain injury

Gilles Lavigne<sup>a,b,\*</sup>, Samar Khoury<sup>a,b,c</sup>, Jean-Marc Chauny<sup>a,b</sup>, Alex Desautels<sup>a,b,d</sup>

**NEW DATA: mTBI & Bruxism and HEADACHE**  
**Correlation between frequency of RMMA and MIDAS**  
**score: HIGHER RMMA with HIGHER MIDAS SCORE**

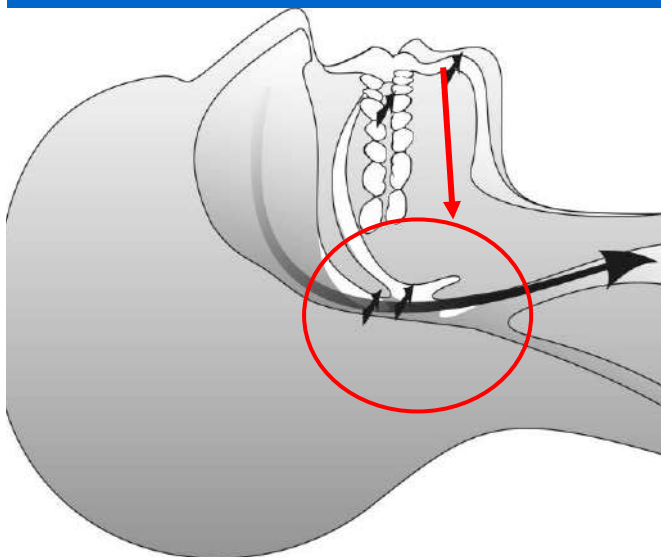
(Suzuki, AADSM meeting 2016; accepted J Oral Facial Pain Headache)

MIDAS score



Spearman's correlation:  
 $r=0.559$ ,  $P=0.006$

**MIDAS 3 & 4 moderate to severe disability ASSOCIATED to higher frequency of RMMA (but independent/ can contribute to predict HA)**



**Airway in sleep:**  
**tongue and**  
**mandible tend to**  
**move downward**  
**and backward**

**Oropharyngeal**  
**domain...**

Cistulli et al Sydney, Australia



## Sleep disorders breathing crescendo

Increasing upper airway  
collapsibility

- Occasional **snoring**
  - Habitual snoring
- TO
- **Upper airway resistance syndrome-RERA**
- TO
- Occasional **apneas or hypopneas**
  - Obstructive Sleep Apnea (OSA) syndrome

RISK OF:

**Metabolic syndrome**

(diabetes, hypertension, obesity)

TO

Car accidents, cardiovascular problems, etc

**Apnea-hypopnea = major limitation and  
cessation of breathing**

(10 sec; O<sub>2</sub> drop by 3%)



Could be :

– Central (lack of motor drive)

Or

– Obstructive

– Both

(Principles and Practices of Sleep Med; Kryger M et al eds; Elsevier, 2011)

## Increased Prevalence of Sleep-Disordered Breathing in Adults

Paul E. Peppard\*, Terry Young, Jodi H. Barnet, Mari Palta, Erika W. Hagen and Khin Mae Hla - *Am J Epidemiol* 2013

Sleep-Disordered Breathing Definition by Age, years	1988-1994, Estimated Prevalence by Sex and Age Strata		2007-2010, Estimated Prevalence by Sex and Age Strata	
	%	95% CI	%	95% CI
<b>Men</b>				
AHI <sup>a</sup> ≥ 5				
30-49	20.0	17.2, 23.1	26.6	22.8, 30.5
50-70	38.5	34.9, 42.4	43.2	39.4, 47.4
30-70	26.4	23.9, 28.9	33.9	30.8, 37.0
AHI ≥ 15				
30-49	6.2	4.4, 8.1	9.5	7.0, 12.1
50-70	13.9	11.5, 16.8	17.4	14.5, 20.6
30-70	8.8	7.3, 10.5	13.0	10.8, 15.2
AHI ≥ 5, ESS score > 10				
30-49	8.5	6.3, 10.8	11.7	9.0, 14.7
50-70	15.3	12.6, 17.8	17.6	14.7, 20.3
30-70	10.8	9.0, 12.6	14.3	12.0, 16.4
AHI ≥ 15, ESS score > 10				
30-49	3.1	1.8, 4.4	4.8	3.1, 6.9
50-70	5.4	4.0, 6.8	7.0	5.3, 8.9
30-70	3.8	2.9, 4.9	5.8	4.5, 7.2
<b>Women</b>				
AHI ≥ 5				
30-49	6.6	4.9, 8.6	8.7	6.5, 11.3
50-70	24.4	20.8, 28.2	27.8	24.0, 31.6
30-70	13.2	11.4, 15.3	17.4	15.2, 20.0
AHI ≥ 15				
30-49	1.9	1.2, 3.0	2.7	1.7, 4.0
50-70	7.4	5.5, 9.5	9.1	6.8, 11.4
30-70	3.9	3.1, 5.0	5.6	4.4, 7.0

## Polygraphy in home or sleep lab (home tend to give higher values of Apnea-Hypopnea index = AHI)

### • CHILDREN

(Dayyat, Sleep Med Clin 2007; AASM 2005)

Snoring: 1 per hr sleep

AHI is noted if 1 or 2

SEVERITY:

Mild= 2-5

Moderate= 5-10

Severe= 10 and more

Prevalence OSA = 27%;  
2-3% need Tx

### • ADULT

(AASM-ICSD 2005 – revised in 2013-14)

Snoring: ?? per hr sleep

AHI 10 and over is treated if  
SLEEPINESS and HBP

SEVERITY:

Mild= 5-15

Moderate= 15-30

Severe= 30 and more

Prevalence OSA = 2-5% up to 15 and  
40% with age in general population



## ***SB& respiration: May be related in some patient?***

**Again, it is  
not explaining  
all causes of SB**

**More than one boat  
in the race**

Photography:  
M Schmittbuhl  
U de Montreal



## **The link between sleep bruxism, sleep disordered breathing and temporomandibular disorders: an evidence-based review.**

Balasubramaniam R, Klasser GD, Cistulli PA, Lavigne GJ. *Journal of Dental Sleep Medicine* 2014;1(1)

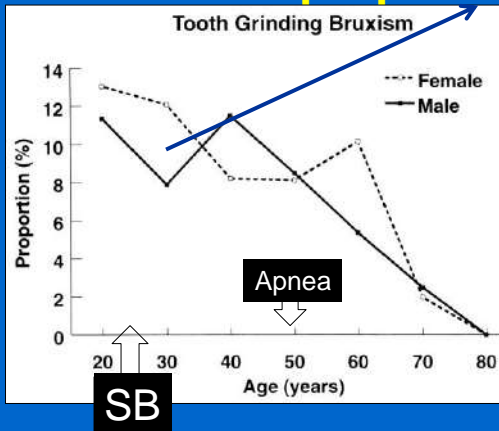
**Table 3**—Common clinical features between sleep bruxism and sleep disordered breathing

Clinical Features	Comment
Both SB and SDB more common in supine sleep position	Studies required to assess influence of postural modification on SB (e.g., sleep positioned benefit not tested yet in a control design for SB)
Oropharyngeal and masticatory muscles activation and tonicity occurs during SB and SDB	Studies required to confirm if masticatory muscle activation during apneic events results in SB plus if it is more the tonic (e.g., clenching type) that is observed or the phasic RMMA
Sleep arousal	Typically in SDB, arousal is observed after airway obstruction; in contrast, SB occurs within a sleep arousal
Gastroesophageal reflux	Conceptually, acid reflux that occurs with SDB, results in a protective response (arousal and swallowing) to prevent mucosal injury and aspiration—indirect clinical evidence and one experimental study
Temporomandibular disorders	Perhaps SB is associated with underlying SDB and consequently the etiology of TMD. Alternatively, SDB may be risk factor for TMD—vulnerability to be proven
Headache	Both tension-type headache and migraine are associated with SB and SDB—based on population survey
Successful treatment with mandibular advancement appliance (MAA)	Further studies investigating the use of MAA in SB is warranted—experimental short term evidence at this stage and large studies required for replication
Successful treatment with CPAP	Further studies required—only one case report
Successful treatment with upper airway surgery	Missing evidence for link between SDB and SB

**Intersecting prevalence with age  
may explain why you see association  
in your practice**

**Sleep Bruxism decreases** ↓

**Sleep Apnea increases** ↑



**AHI 15 and over:**

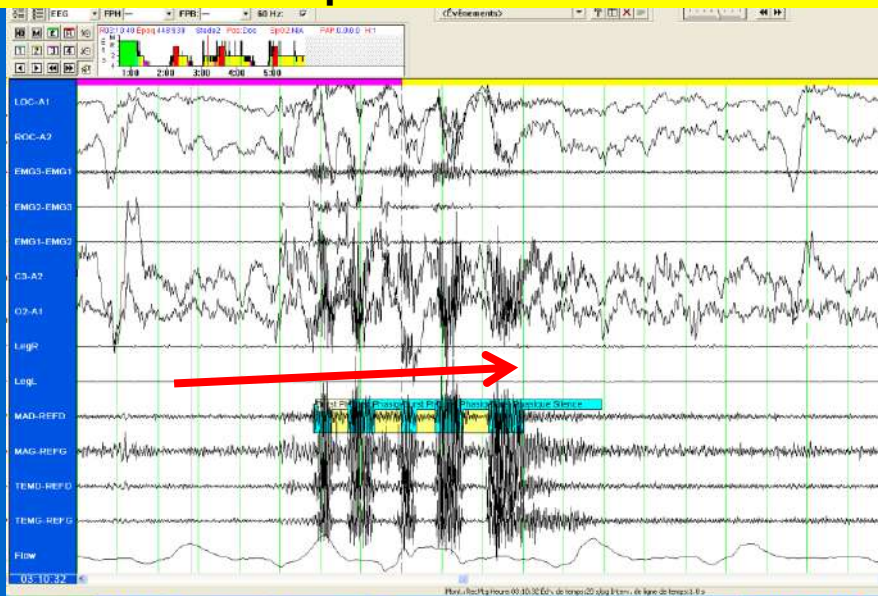
↑ **9.5% to 17.4**

Peppard 2013

**SB ↓ 12% to 3%**

Lavigne & Montplaisir  
Sleep 1994

**Arousal precedes RMMA SB  
APNEA precedes Arousal...**



**General Sleep Lab population (n=1042)**  
**No association with DEPRESSION, OSAS, SNORING**  
**but YES with INSOMNIA (Maluly, J Dent Res 2013)**

		No Bruxism		Bruxism		Total N	$\chi^2$	p
		N	% (CI 95%)	N	% (CI 95%)			
OSAS	No OSAS	389	91.2 (85.8-93.6)	38	8.8 (6.4-14.2)	427	0	.93
	OSAS	180	91.0 (84.1-94.0)	18	9.0 (5.9-16.0)	198		
Snoring	No snoring	328	91.8 (89.0-95.5)	29	8.2 (4.5-11.0)	357	0.7	.39
	Snoring (3x or more/wk)	241	90.0 (81.1-92.1)	27	10.0 (7.9-18.9)	268		
RLS	No RLS	441	90.7 (86.5-93.2)	42	9.3 (6.8-13.5)	483	3.0	.38
	RLS	101	88.5 (60.8-97.6)	13	11.5 (2.4-39.2)	114		
Insomnia	No insomnia	508	92.0 (87.2-94.5)	44	8.0 (5.5-12.8)	552	5.6	.01
	Insomnia	61	83.5 (93.6-82.9)	12	16.5 (6.4-17.1)	73		
Anxiety	No anxiety	482	92.6 (90.1-95.1)	38	7.4 (4.9-9.9)	520	1.1	.28
	Anxiety	37	88.0 (69.7-94.3)	5	12.0 (5.7-30.3)	42		
Depression	No depression	468	92.6 (90.0-94.7)	37	7.4 (5.3-10.0)	505	1.0	.30
	Depression	47	88.6 (78.5-96.2)	6	11.4 (3.8-21.5)	53		

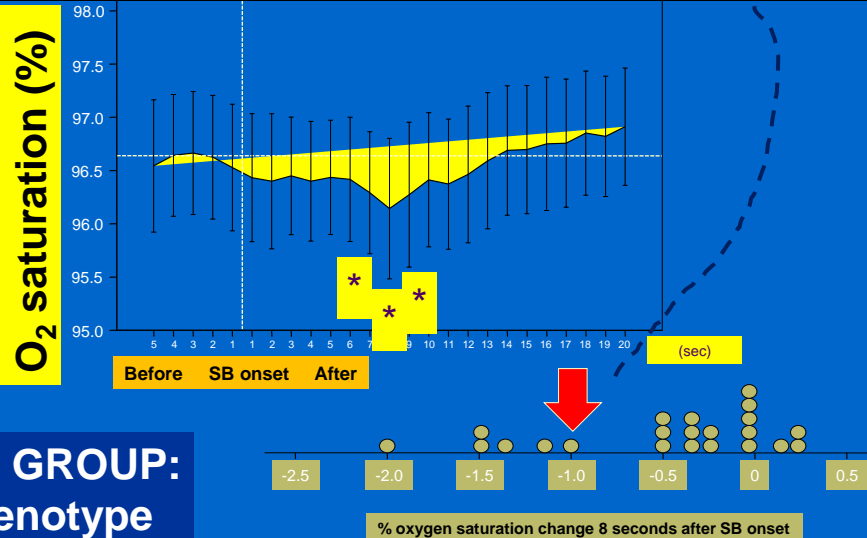
OSAS = Obstructive Sleep Apnea Syndrome; RLS = Restless Legs Syndrome.

M. Maluly et al, J Dent Res 2013  
 Sleep lab (1 night) =  
**AHI same & SaO<sub>2</sub> no difference**  
**IN SB PATIENTS**  
 (large population and large age range/  
*Investigate cluster – sub group*)

AHI	No bruxism	569	7.7 (4.4-11.1)	12.44	.31
	Bruxism	56	6.2 (6.8-8.9)	10.09	
SaO <sub>2</sub> mean (%)	No bruxism	569	95.2 (94.9-95.9)	1.92	.38
	Bruxism	56	95.4 (95.0-95.4)	1.52	

## A sub group of SB patients (27%) present mild hypoxia (SaO<sub>2</sub> 1-1.8%) in relation to RMMA?

I Dumais et al J Oral Rehab 2015



## Do OSA patients present SB?

### Yes in 46.6% and 46.8% of OSA cases

(Sjoholm et al 2000 and Hosoya et al 2014)

Plus a novel **pilot study**, complex for me to interpret:

Of **57** or 46 patients referred for OSA Dx....

- **11** reported of bruxism ( me= 20 or 24%)

- After Nox T 3 ambulatory recording: 9 had + OSA (me= 16 or 20%)

...

77.8% had + PSG (2 RMMA and +) and + 2 grinding sounds

Sequence: **Apnea to SB** was dominant (unclear... data)

Rev Port Pneumol. 2017; 23(1): 22-26

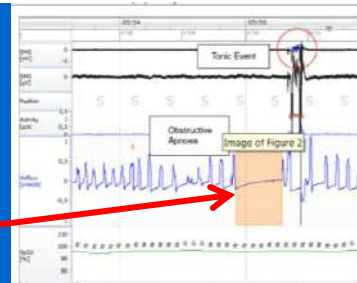


revista portuguesa de  
**PNEUMOLOGIA**  
portuguese journal of pulmonology  
www.revportpneumol.org

#### BRIEF COMMUNICATION

Sleep bruxism associated with obstructive sleep apnoea syndrome – A pilot study using a new portable device

M. Winck<sup>1,2,\*</sup>, M. Drummond<sup>3</sup>, P. Viana<sup>4</sup>, J.C. Pinho<sup>5</sup>, J.C. Winck<sup>6</sup>



## Temporal association

Cause and effect:

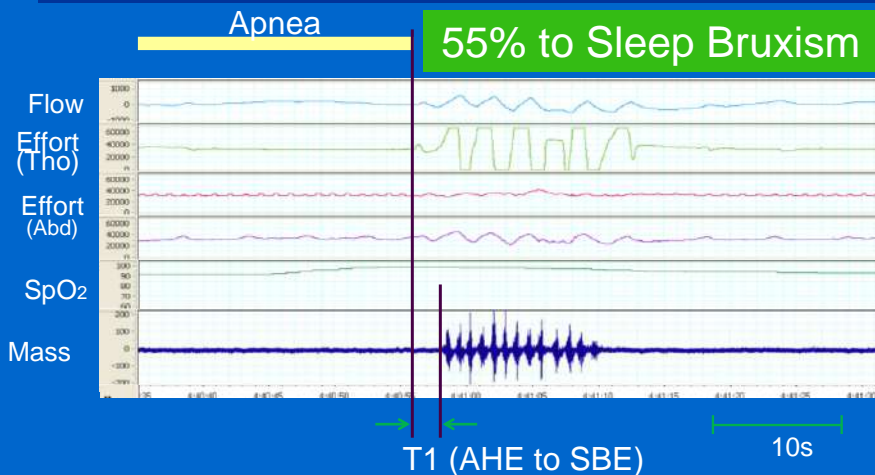
***Cause should precede the effect***

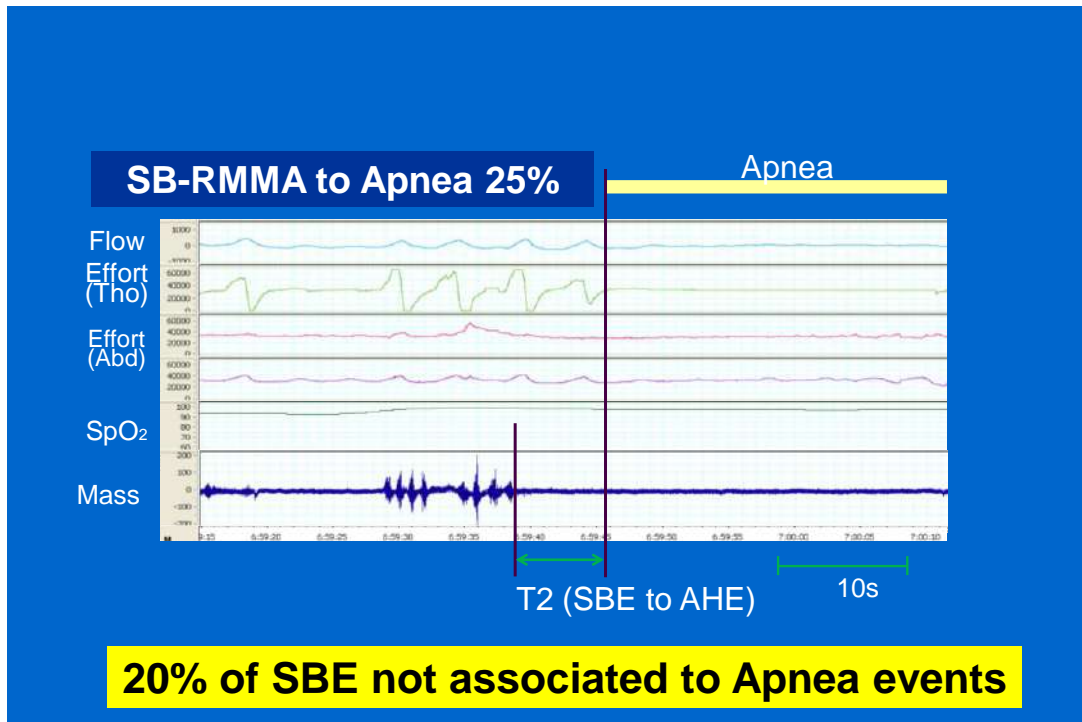
- RMMA and Apnea or hyponea timing
- Can be experimentally reproduced

Or

***Altered by treatment***

**What is first SB-RMMA or Apnea?** Miku Saito et al,  
Hokkaido University, Sapporo, Japan  
(J Sleep Res 2014)





**Sleep bruxism and sleep-disordered breathing: a systematic review.**

De Luca Canto G, Singh V, Gozal D, Major PW, Flores-Mir  
J Oral Facial Pain Headache. 2014 Fall;28(4):299-305

- *There is **not sufficient scientific evidence** either to **confirm or discredit** the association between SB and SDB*
- 333 papers= only one and no temporal conjunction!
- Too early or may not exist in all cases?

**SEE also: Jokubauskas L and Baltrusaityte A**

in J Oral Rehab 2016 (E) now 2017 ...

***not enough scientific data***



## GERD

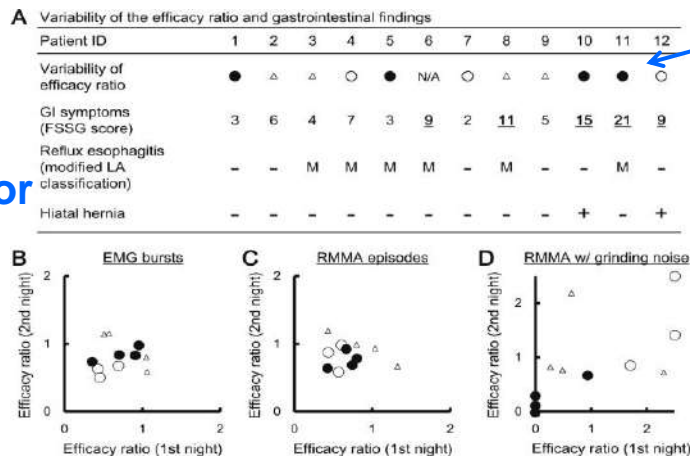
### Self-Reported Sleep Bruxism and Nocturnal Gastroesophageal Reflux Disease in Patients with Obstructive Sleep Apnea

Hesselbacher et al, Open Respir Med J. 2014

- **OSA patients:** 150 female/150 male with AHI+ 5/h
- **26%** of OSA self report **Sleep Bruxism** (35% in Caucasian; 19% in Hispanic/ no gender diff)
- **35%** of OSA self report **GERD**
- **35%** of OSA self report **Restless Leg Syndrome**
- **80%** of OSA self report **Insomnia**



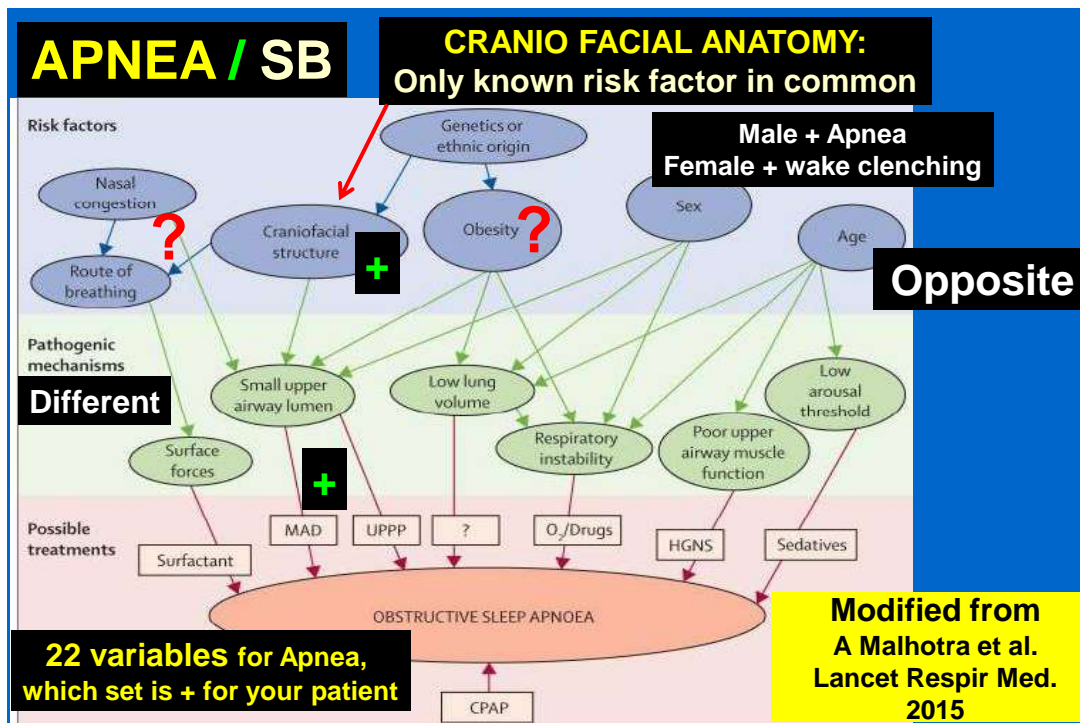
## Proton Pump Inhibitor



+ in 7/12 cases  
and ++ in 4/12


Figure 2. (A) Variability of the efficacy ratio and gastrointestinal (GI) findings. (B–D) Scatterplots of the efficacy ratios for electromyography (EMG) bursts, rhythmic masticatory muscle activity (RMMA) episodes, and RMMA episodes with grinding noise. Filled circles indicate the patients who demonstrated an efficacy ratio of <1 (i.e., positive therapeutic effects from proton pump inhibitor [PPI]) for all parameters on both the first and second nights. Empty circles indicate the patients who demonstrated an efficacy ratio of <1 for EMG bursts and RMMA episodes on both the first and second nights. Triangular marks indicate the patients who demonstrated an efficacy ratio of >1 (i.e., negative therapeutic effects from PPI) for EMG bursts or RMMA episodes on either the first or second night.

Published in: H. Ohmure; K. Kanematsu-Hashimoto; K. Nagayama; H. Taguchi; A. Ido; K. Tominaga; T. Arakawa; S. Miyawaki; *Journal of Dental Research* 95, 1479-1486.  
Copyright © 2016 International & American Associations for Dental Research


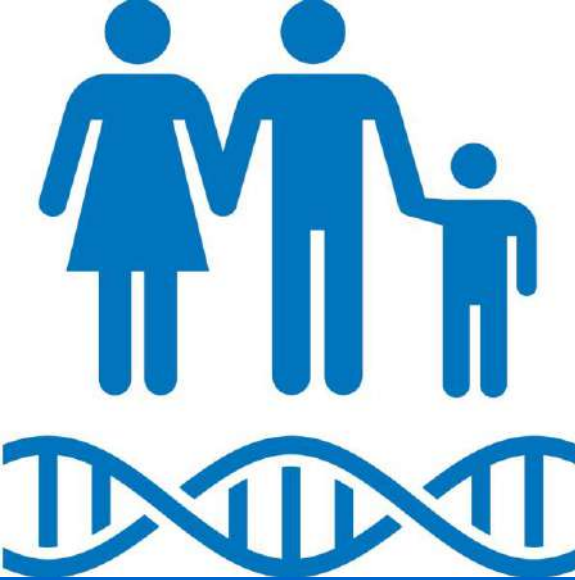








**5- SB ---- Genetic... no gene therapy for bruxism**



**SB & Genetic:**

**FAMILIAL +  
Learning habits-tics  
from parents?**

**No gene therapy  
for bruxism**

<http://www.geneticdisordersuk.org/aboutgeneticdisorders>

## Phenotyping SB patients and blood relatives for genetics polymorphism

### QUESTIONNAIRE STUDY:

- 49% of male and 64% of female **SB phenotype variance** is due to **Genetic and environmental factors**: Hublin et al 1998 J Sleep Res (2419 heterozygotic twins; 1298 homozygotic twins)
- **Genetic factors account for half of the phenotypic variance** in liability to sleep-related bruxism in young adults: a nationwide Finnish twin cohort study. Rintakoski K et al 2012

## Phenotyping SB patients and blood relatives for genetics polymorphism

**Sleep recording: 48% genetic and 52% environment**  
Takaska et al, Cli Oral Invest 2017

### SLEEP LAB STUDY:

**37% of mild and severe SB subjects (EMG frequency criteria) have one direct blood relative with tooth grinding Hx = suggest modest hereditary effect**

**RISK RATIO of 2.5**

Khoury et al, SLEEP 2016; Montreal SB population (n=111 with 2 nights of sleep)

## Phenotyping SB patients and blood relatives for genetics polymorphism

An association of serotonin receptor (C allele carrier HTR2A) and bruxism  $RR=4.2$  (Abe Y from Baba labs; J Sleep Res 2012) – Ambulatory one channel EMG study – limited discrimination

- See also Hoashi Y et al, J Prostho Res 2016 (+ in cell culture)
- See Oporto GH et al, J Oral Rehab 2016 (OR 2.1 for SB not for AWAKE brux... but questionnaire based)

**SPECIFICITY is ?**: 5Ht involved in pain, sleep, anxiety, depression, STRESS

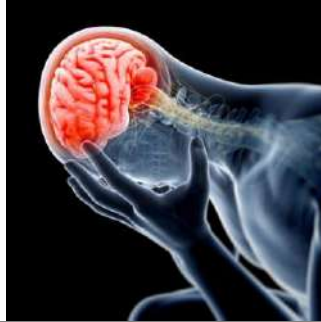
**Not a single gene expected**: See the OPERRA TMD Study: **202 phenotypes and 5 gene candidates**; Smith, J Pain 2013

## PLUS, better define specificity to SB

### STRESS MARKER

- Cortisol from saliva or urine  
( see Karakoulaki S, IJP 2015 and others before)
- Chromagramin A (CgA; role pancreas?)  
(see Makino M<sup>et al</sup>, IJP, 2009)
- ?? Brain, motor system, etc

## **6- SLEEP BRUXISM and Morning Transient OroFacial Pain**



**More Sleep Bruxism EMG activity  
does not = More PAIN**

## **Morning headache**



[www.boldsky.com/health/disorders-cure](http://www.boldsky.com/health/disorders-cure)

## Morning HEADACHE: migraine or *tension type HA*

LOW ON EVIDENCE YET

- a frequent complaint affecting 7.6% of the general population (Ohayon 2004)
- empirically defined as a recurrent, bilateral and pressing pain, present at awakening  $\geq 3$  times/week and lasting from 30 min up to 4 hrs
- pressing sensation (in over 60% of cases) and throbbing (in 11 to 46%)

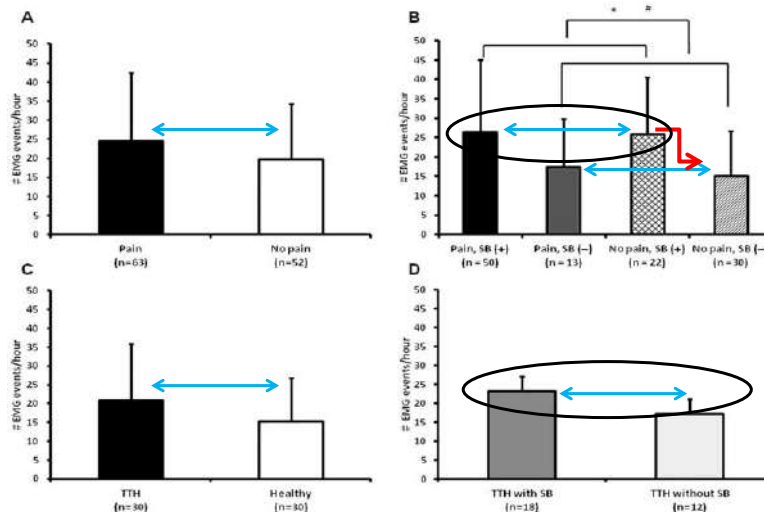
## No more RMMA contraction in Morning Transient Pain (Abe S, JOFP, 2013)

Table 3 Sleep and RMMA Parameters for Controls (CTRL), Sleep Bruxers with Pain (SBrP), and Sleep Bruxers without Pain (SBrN)

	CTRL (n = 19) a	SBrP (n = 44) b	SBrN (n = 18) c	ANOVA <sup>†</sup>	P value		
					Tukey test		
					a vs b	a vs c	b vs c
Age	24.05 ± 1.26	26.27 ± 0.84	26.61 ± 1.31	.32			
Sex	8 F/11 M	30 F/14 M	9 F/9 M				
Sleep stage shift	241.32 ± 15.35	197.80 ± 7.49	200.39 ± 11.71	.01	< .01	.02	.86
Microarousals/hr*	9.33 ± 2.02	6.82 ± 0.62	7.38 ± 0.96	.64			
RMMA episodes							
Episodes/hr*	1.34 ± 0.22	4.25 ± 0.42	5.15 ± 0.83	< .001	< .001	< .001	.72
Phasic episodes/hr*	1.00 ± 0.23	2.79 ± 0.38	2.89 ± 0.56	< .01	< .01	< .01	.81
Tonic episodes/hr*	0.03 ± 0.02	0.11 ± 0.03	0.15 ± 0.09	.38			
Mixed episodes/hr*	0.31 ± 0.09	1.28 ± 0.18	2.01 ± 0.42	.01	.15	.01	.20
Episodes with noise*	0.37 ± 0.17	7.18 ± 1.48	13.06 ± 4.46	< .001	< .001	< .001	.64



## Comparison of the EMG data (# of EMG events per hour of sleep) between different groups – ONE CHANNEL EMG: temporalis



Yachida W et al. J DENT RES 2012;91:562-567

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## Association between tension-type headache and migraine with sleep bruxism: a systematic review. De Luca Canto G et al. Headache. 2014

- Of **449** identified citations, **only 2 studies**, both studying adults, fulfilled the inclusion criteria.
- The presence of **SB significantly increased the odds** (study 1: odds ratio **3.12** and study 2: **3.8**) for **headaches**, although studies reported different headache type.

### CONCLUSION:

*There is not enough scientific evidence .....*

## 7- Temporomandibular Disorder and SLEEP BRUXISM



TMD/Ctl = Same RMMA-SB index / K Raphael-JADA 2012

Laboratory polysomnographic (PSG) comparison of sleep bruxism (SB) among case and control participants.

PSG	CONTROL PARTICIPANTS (n = 46)		CASE PARTICIPANTS (n = 124)		P VALUE ( $\chi^2$ OR FISHER EXACT TEST)
<b>Criterion</b>	<b>No. (%)</b>		<b>No. (%)</b>		
Met research diagnostic criteria (RDC)/SB criteria	5 (10.9)		12 (9.7)		.818
Met subthreshold RDC/SB criteria	8 (17.4)		21 (16.9)		.915
Had two or more episodes with grinding noise	36 (78.3)		74 (59.7)		.038
<b>Measure</b>	<b>Mean (SD)*</b>	<b>Median</b>	<b>Mean (SD)</b>	<b>Median</b>	<b>P Value (Median Test)</b>
<b>RMMA episodes</b>					
Count per hour	1.7 (1.9)	1.0	1.5 (1.9)	0.8	.388
Duration, seconds	56.4 (69.5)	24.5	47.9 (69.7)	21	.989
<b>RMMA episodes with grinding</b>					
Count per hour	1.0 (1.1)	0.5	1.0 (1.5)	0.4	.615
Duration, seconds	36.2 (49.9)	15.5	31.3 (55.0)	11.0	.294
<b>Other orofacial activities</b>					
Count per hour	9.4 (7.2)	7.1	10.1 (8.5)	7.1	.863
Duration, seconds	122.5 (130.9)	87.0	127.8 (122.5)	87.0	.937
<b>Other muscular activities</b>					
Count per hour	6.1 (2.9)	5.8	6.5 (4.5)	5.1	.605
Duration, seconds	139.3 (70.3)	119.5	150.0 (104.7)	127.5	.937

\* SD: Standard deviation.

**Again, no more EMG SB related difference  
but poorer sleep if TMD  
(pain 4.9/10; 76% morning pain or soreness)  
Schmitter M et al, Sleep Med 2015**

**Table 1**  
Results from EMG recordings:

	Control group		TMD group		p
	Mean	SD	Mean	SD	
Episodes per hour	4.10	2.65	4.57	1.99	0.31
Bursts per hour	14.74	10.05	16.21	9.60	0.41
Average burst duration	2.17	1.01	2.20	1.14	0.97
Intensity	456.40	324.07	537.24	268.52	0.25
Measurement hours	7.34	1.39	7.06	1.44	0.66

**71% fits ICSD 3 -2014  
screening criteria**

Relevant sleep-associated differences between TMD patients and controls based on EMG measurement, ICSD 3, anamnesis, and questionnaires.

	Control group	TMD group	p
Percentage of bruxers based on EMG data	68%	95%	0.02
Percentage of bruxers based on ICSD 3 criteria	14%	71%	<0.001
Percentage of subjects bruxing each night	46%	75%	0.04
Percentage of subjects reporting pain in the morning	0%	76%	<0.01
PSQI global score [0-21]	4.38 (SD 3.04)	7.52 (SD 3.72)	0.006
SF/AR sleep quality [1-5]	4.02 (SD .74)	3.34 (SD 0.88)	0.017

**Sleep and awake bruxism in adults and its  
relationship with temporomandibular disorders: A  
systematic review from 2003 to 2014.**

**Jiménez-Silva A et al, Acta Odontol Scand. 2017**

- Thirty-nine studies (n = 39)
- Polysomnographic diagnosis (PSG) (n = 7), clinical diagnosis (n = 11) and survey/self-report (n = 21).
- **33 established a positive** relation between bruxism and TMD and **6 did not**.

**CONCLUSION:**

*...evidence... is inconclusive .... suggest that bruxism  
would be associated with TMD .....*

## **Sustained activity / periodic activity** **Wake time carry over influences**

**In TMD cases= pain due to... ??**

**Elevated - Sustained Activity in all sleep period for 72% of TMD cases (n:124/ 42 Ctl)**

(K Raphael, JOR 2013)

**Background EMG during non-SB event periods is significantly higher for women with myofascial TMD (median = 331 uV and mean = 498 uV) than for control women (median = 283 uV and mean = 388 uV)**

**Background EMG was positively associated with pain Intensity AWAKE – CARRY OVER ?**

**WHILE RMMA-SB event related EMG was negatively...**

## **Possibility 2: Non functional tooth contact**



**Another PARAFUNCTION (long-lasting and low-intensity muscle contraction) during WAKE as a RISK factor for Chronic TMD pain**

**Non functional tooth contact**

Not bruxism

Long-lasting,  
not forceful clenching

Wake time collection/ 20 min  
beeper, cell phone, etc



**TMD & Non functional tooth contact**

(Not bruxism; long-lasting,  
not forceful clenching)



- FREQUENCY: median **TMD 35%/ Ctl 9%**
- link with **STRESS**

Chen , Palla et al, J of Orofacial Pain, 2007

**IN 52% of TMD cases: Sato F et al 2006**

**Also reported by: Glaros et al, Cranio 2005**

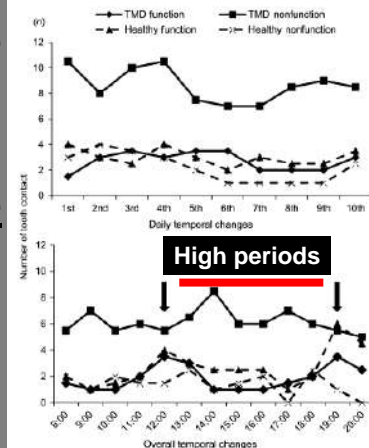


## REPRODUCED:

### TMD & Non functional tooth contact

- Frequency of **non-functional tooth contact** significantly **higher in patients with TMD** than in the healthy subjects (**35.0% vs. 9.6%**,  $P < 0.001$ )
- No significant group difference for the frequency of functional tooth contact, the stress, anxiety, depression and personality.

Funato et al, J Oral Rehab 2014



## Fiction or Reality

How solid is the link, the association,  
the bridge

Over 100 variables to identify RISK  
factors; normal activity to unusual  
behavior to disorder...



Ice bridge from Paladinaz



## 8- SB ----- Management



**OTHER management for SB: *Effect & Level of evidence***  
*Winocur, in Sleep Med for Dentist, Quintessence, 2009*

### ***Behavioral management approaches:***

- Explanation of causes and exacerbation factors for SB
- Elimination of clenching teeth and bracing jaw during daytime in reaction to life pressures
- Lifestyle changes; introduction of sleep hygiene, relaxation, autohypnosis, and winding down before sleep
- Physical therapy and training in relaxation and breathing
- Psychologic therapy to manage stress and life pressure

**Questionable effect – Weak evidence so far but patients report subjective well-being!**

**Do sleep hygiene measures and progressive muscle relaxation influence sleep bruxism?**  
**Report of a randomised controlled trial.**

***No effect of sleep hygiene measures together with progressive relaxation techniques on sleep bruxism or sleep over a 4-week observation period***

BUT n of 8 per group, power probably too low for such outcome – SEE NEXT SLIDE

Valiente López M et al (Lobbezoo F lab)  
**J Oral Rehab 2015**

**Comparative efficacy of behavioral therapy, cognitive therapy, and cognitive behavioral therapy for chronic insomnia: a randomized controlled trial**


n= 188, 2 sites USA and CAN, New Tx 8 weeks and 6 months later  
 Harvey AG et al, J Consul Cli Psycho 2014

ISI Response - % (reduction of at least 8 points from baseline)


t1 (Pre)						
t2 (Post)	67.25 (6.99)	42.42 (6.65)	67.35 (7.00)	cond/t2	4.84, $p = .01 (.02)$	CBT=BT>CT
t3 (FU6)	67.55 (6.98)	62.59 (7.12)	44.44 (7.74)	cond/t3	2.94, $p = .06$	<b>60/40%</b>
Change t2-t3	0.30 NS	20.17 ***	-22.91 ***	cond/t2-t3	10.07, $p = .00 (.00)$	CT>CBT>BT

ISI Remission - % (ISI < 8)

t1 (Pre)						
t2 (Post)	57.29 (7.40)	30.84 (6.33)	39.37 (6.78)	cond/t2	3.81, $p = .02 (.02)$	CBT>CT
t3 (FU6)	55.82 (7.29)	51.62 (7.34)	36.45 (7.08)	cond/t3	2.21, $p = .11$	<b>60/30%</b>
Change t2-t3	-1.47 NS	20.78 **	-2.92 NS	cond/t2-t3	3.86, $p = .02 (.02)$	CT>CBT=BT



**Role of OCCLUSION ?**  
Manfredini M J Oro Facial Pain 2012  
**Lateroretrusive +  $p=0.03$**   
**But only 4.6% Variance**  
**of BS & Occlusion**  
**Low PREDICTIVE value for Tx**



**After controlling for 16 occlusion variables**  
**= NO relation with SB**  
**Ommerborn M, Int J Oral S 2012**



**Sleep bruxism**  
**and implant failures**



Chrcanovic BR et al J Oral Rehab 2016

- Implant failure rate= **13%** in self reported bruxism subjects/ **4.6%** in non bruxism
- 179 failures/3549 implants= **5%**
- Health risk of bruxism= **3.4** (CI: 1.3-8.8;  $p=0.012$ )
- Other factors: **implant size, bone quality, smoking, proton pump inhibitors= GERD-reflux?**



## Sleep bruxism and implant failures



**Sleep study:** Anitua E et al  
J Oral Implantology 2017

- 172 **OSA (apnea)** patients
- 16/67 (**24%**) patients  
had implant supported prosthesis
- **13/16 who had complications**  
& were positive for OSA



## Sleep bruxism and implant failures



What to do?



May be, no study  
but sounds logical

**If apnea- be cautious... with upper/maxillary splint**

## Management with oral appliances



### ORAL APPLIANCES

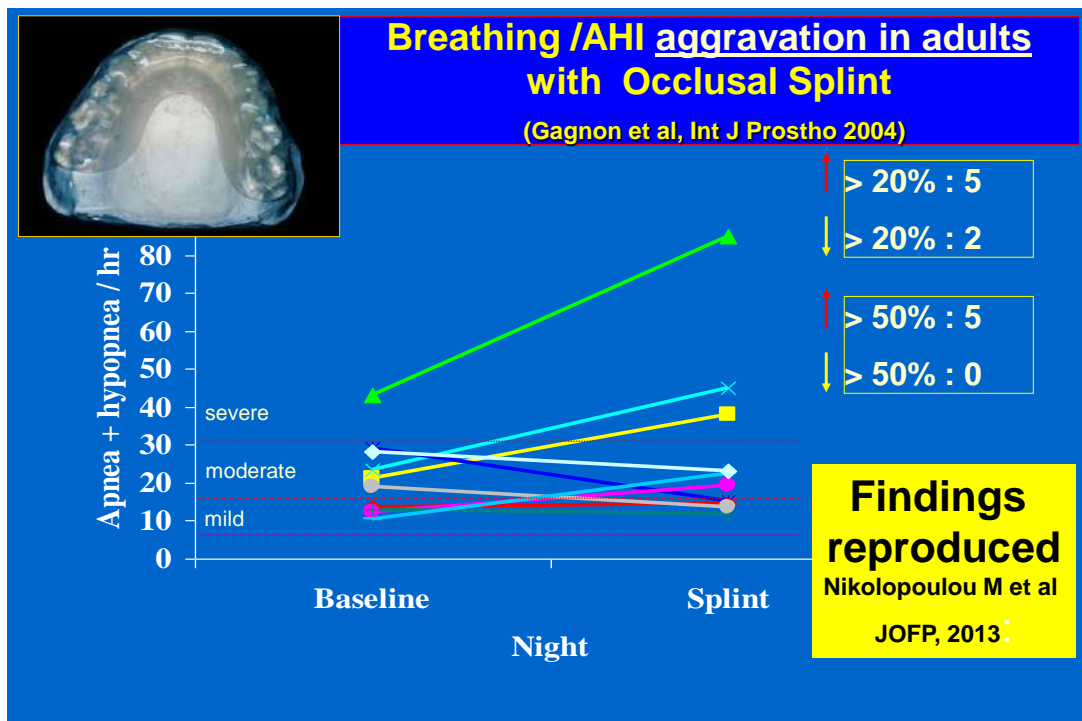
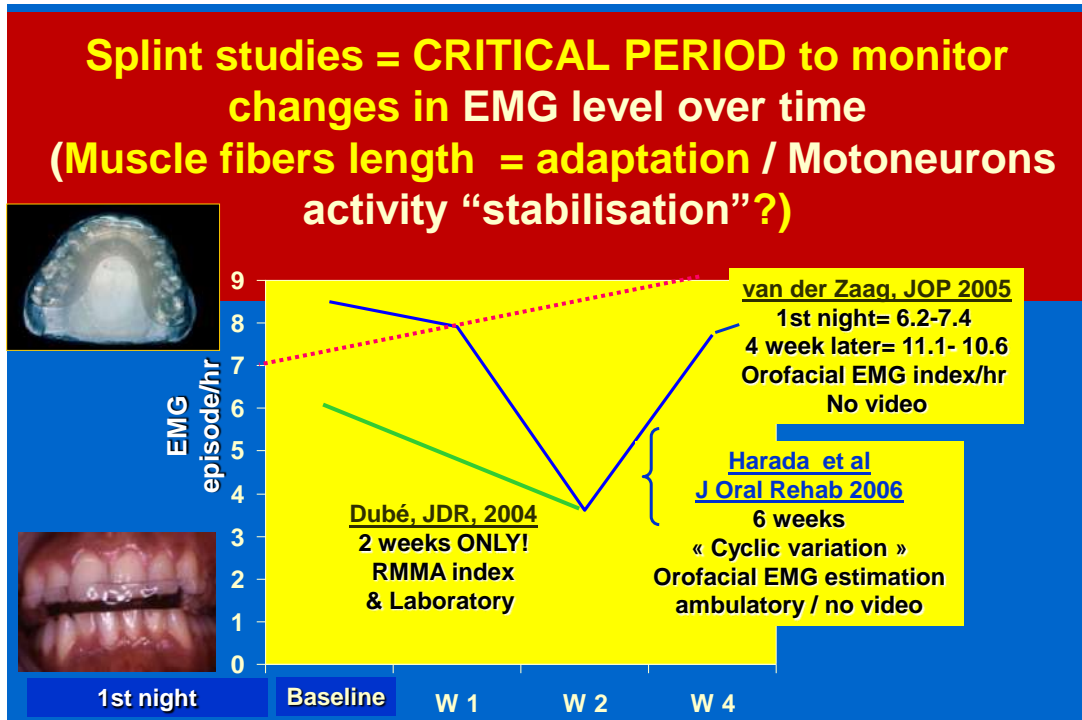
- **Occlusal Splint:** to prevent tooth damage  
Ideal on lower jaw if risk of Sleep Breathing Disorder/snoring-apnea
- **Mandibular Advancement Device/Appliance**  
If you suspect breathing issues...  
Then follow-up in sleep medicine to monitor **BREATHING** (home recording)
- **NTI<sub>TM</sub> or home made deprogrammer:**  
For short term use + evidence but risk/hr use  
Svensson, J Oral Rehab 2007



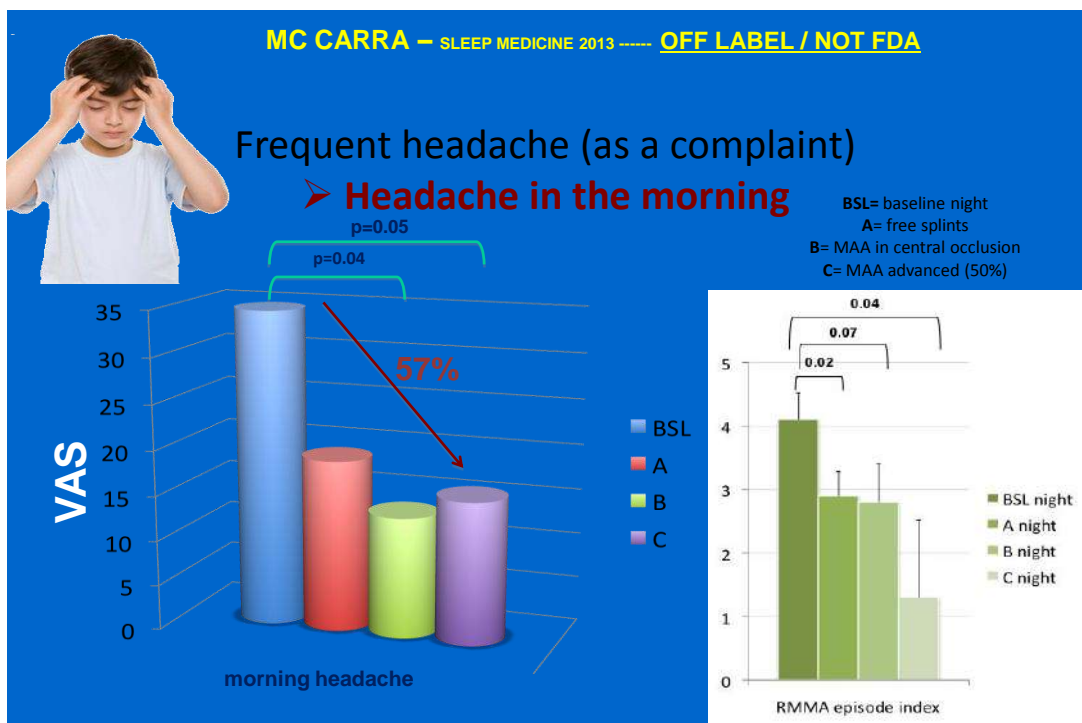
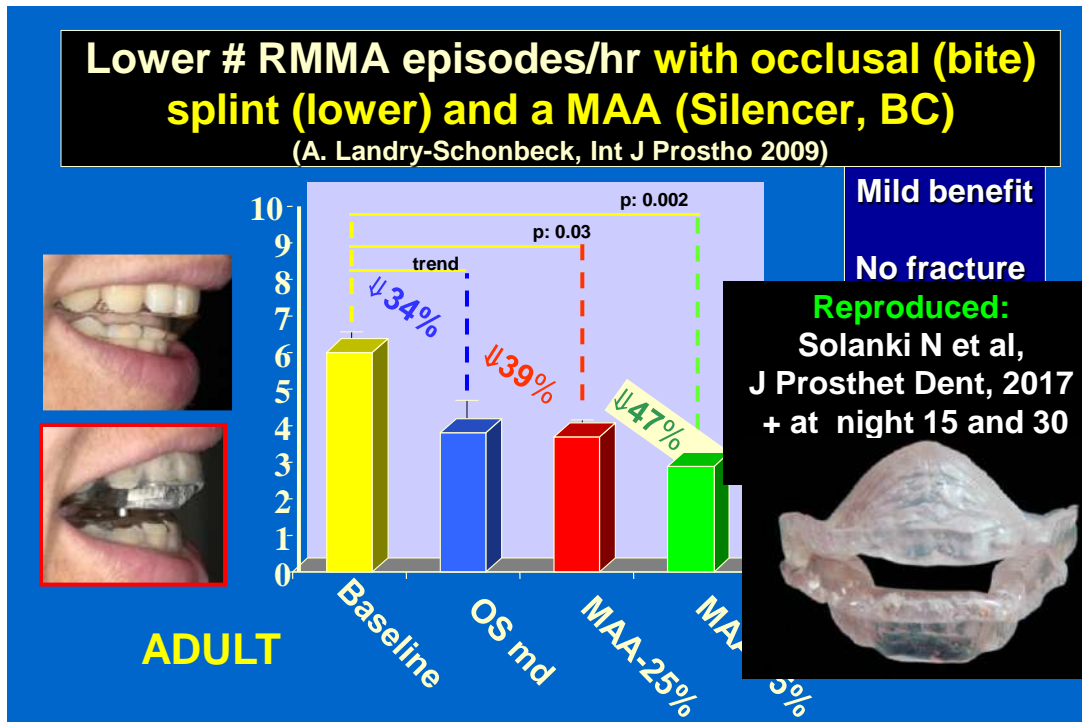
Somnomed

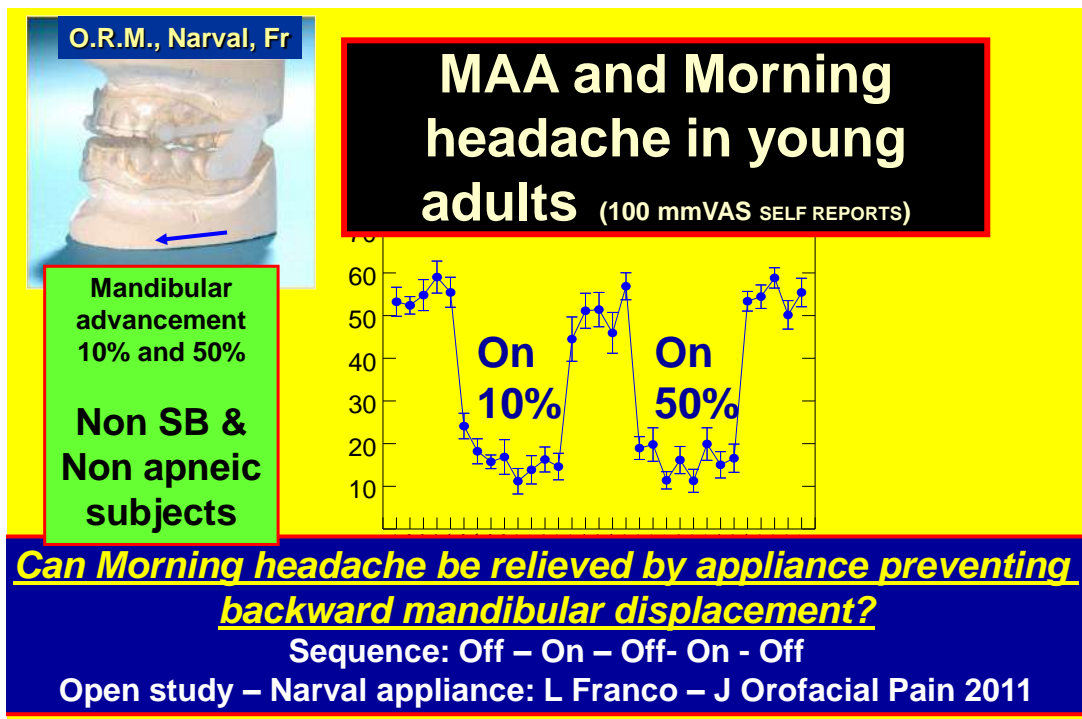
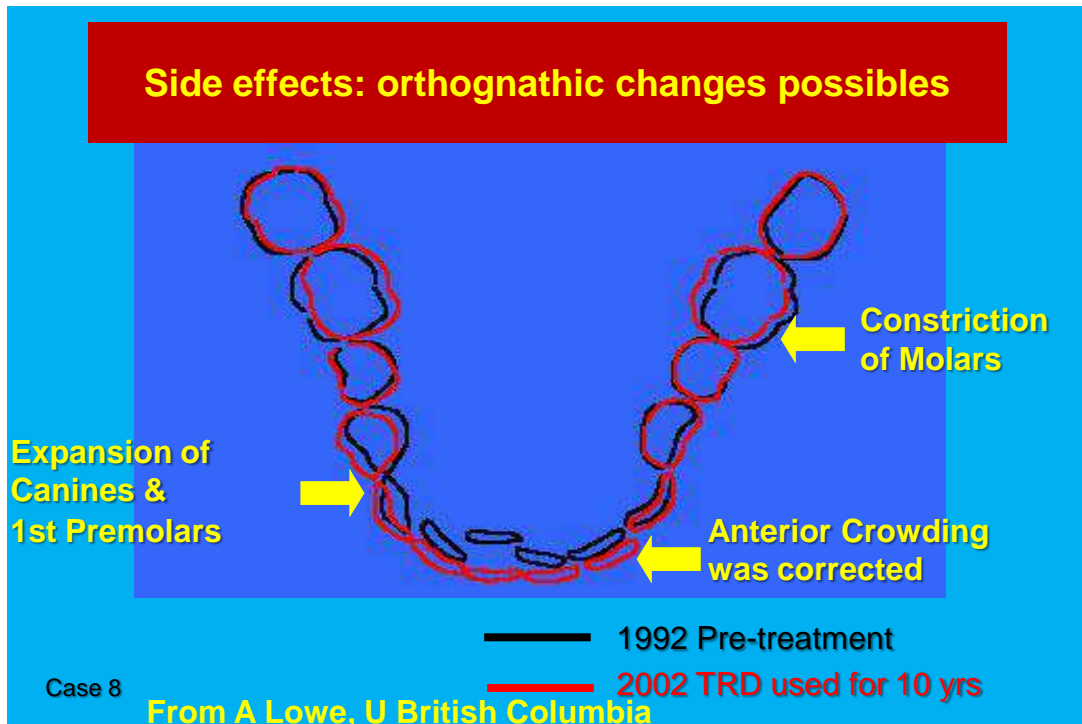


Narval, ResMed





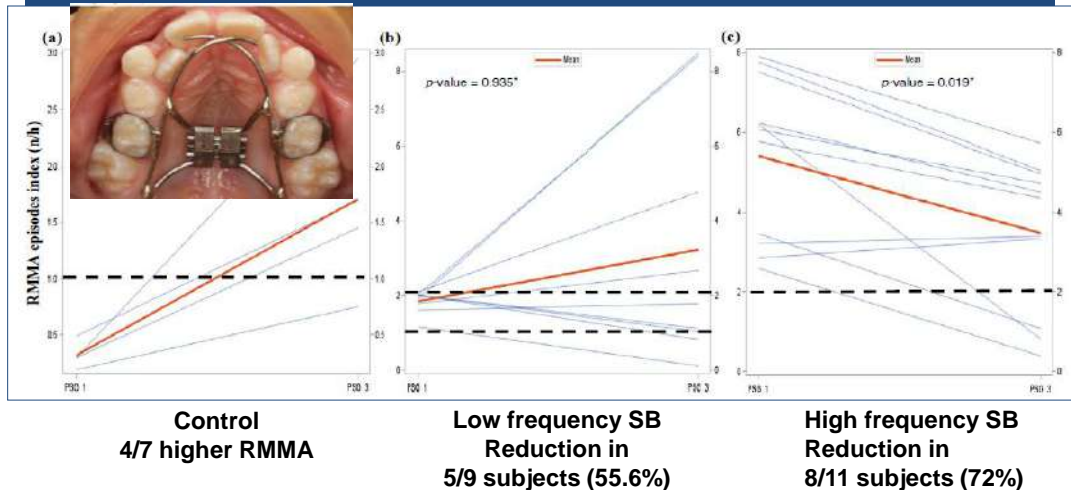




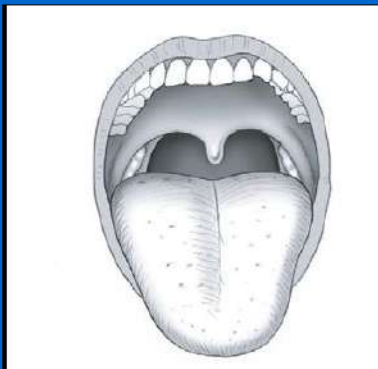
## The effect of rapid palatal expansion (5.6-6.6 mm) on sleep bruxism in children (11 yo).

Bellerive A et al, Sleep Breathing 2015

In **65% of subjects**= reduction over 25% in RMMA-SB index



## Tonsil removal



- Tonsillectomy: **may improve** child behavioural problems such as attention, hyperactivity and sleepiness

(Wei JL et al. Arch Otolaryngol Head Neck Surg. 2007 + Chervin RD et al Pediatrics, 2006)

- **AFTER tonsil removal 10-15% child still present sleep apnea-hypopnea** (Mitchell RB; Laryngoscope 2007)

- **debate on surgery: total reduction in only 25%** (Tauman R et al J Pediatric 2006) and **44% cure** (NG et al Sleep Med 2010)

- **For bruxism: only questionnaire study suggesting + results (cases + reduction)**

(DiFrancesco RC et al, Int J Pediatr Otorhinolaryngol. 2004; Eftekharian A, Int J Pediatr Otorhinolaryngol. 2008)

## Medical management

**CPAP = Continuous Positive Airway Pressure (1980)**

- **Gold Standard for SDB-OSA (not central one)**
- **< on compliance (50-70% to 29% in mild cases)**

**Did not work in our young healthy SB**

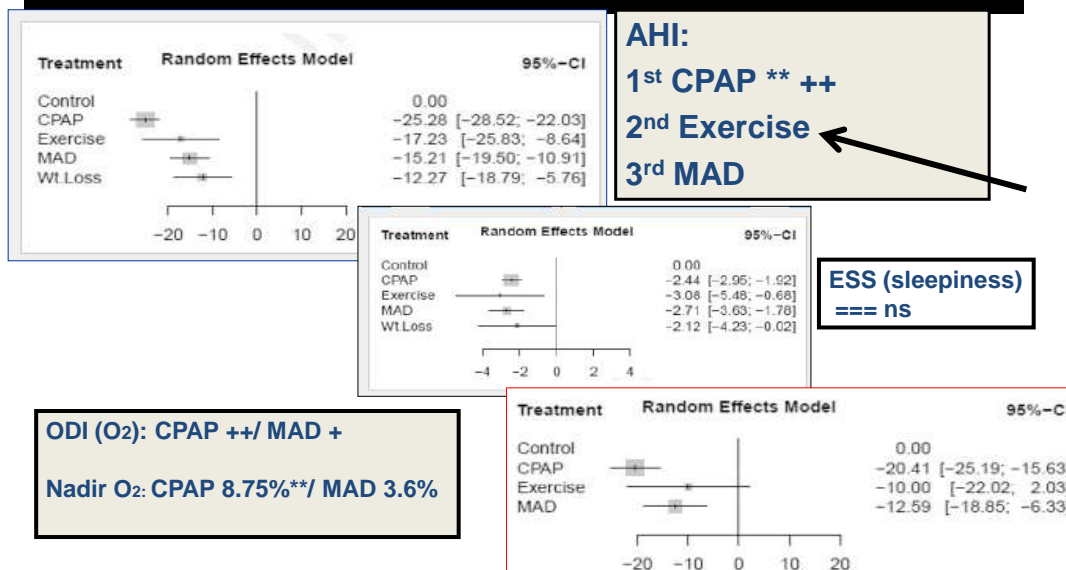
**One + case report in an OSA severe case**

Oksenberg A, Arons E.  
**Sleep Med 2002**



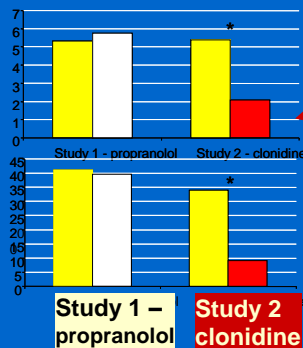
[https://en.wikipedia.org/wiki/Positive\\_airway\\_pressure](https://en.wikipedia.org/wiki/Positive_airway_pressure)

**OSA: Meta analysis (80 RCT) - Iftikhar IH et al, Sleep Med 2017**  
**ROLE OF EXERCISE UNKNOWN FOR SLEEP BRUXISM**





## Management Pharmacologic Approaches



### Cardioactive (proposed by Sjöholm):

1- Propranolol NO EFFECT in Experimental RCT

BUT

**OFF LABEL**

2- Clonidine 0.3 mg:

60% reduction but hypotension in 20% of subjects (Huynh et al, SLEEP 2006)

Reproduced (Baba et al J Sleep Res 2016 Japan) with 0.15 mg & no problem...Rx by MD

## OVERVIEW on PHARMACOLOGICAL management for SB

*Effect & Level of evidences – Winocur, Sleep Med for Dentist, Quintessence, 2009*

- Sedative and muscle relaxants: (see Sakai et al, J Sleep Res 2016)
  - **Clonazepam**= Positive effect to negative, Risk of dependence: DEBATED
  - **Diazepam, buspirone**= Positive effect / Case reports - Risk of dependence

- Serotonin-related: (Uca et al, Clin Neuropharmacol 2015)  
PARADOX WITH GENETIC FINDINGS – secondary SB by some SSRI???
- **Tryptophan**= No effect
- **Amitriptyline**= No effect in RCT or RISK to increase

- Dopaminergic: (us and Cahlin et al, J Sleep Res 2016)
  - **Levodopa**= Modest effect in RCET (30%) – Moderate evidence
  - **Pergolide**= Positive effect - Case report – implant related!
  - **Bromocriptine, Pramipexole**= No effect in RCT

**OFF LABEL**

- Cardioactive: (Huynh et al SLEEP 2006; Sakai et al J Sleep Res 2016)
  - **Clonidine**= Positive effect in RCET – Moderate evidence - risk of hypotension in morning – MEDICAL supervision and lowest dose
  - **Propanolol**= No effect in RCET

NEW RESEARCH

JCSM  
Journal of Clinical  
Sleep Medicine

Off Label

<http://dx.doi.org/10.5664/jcsm.3532>

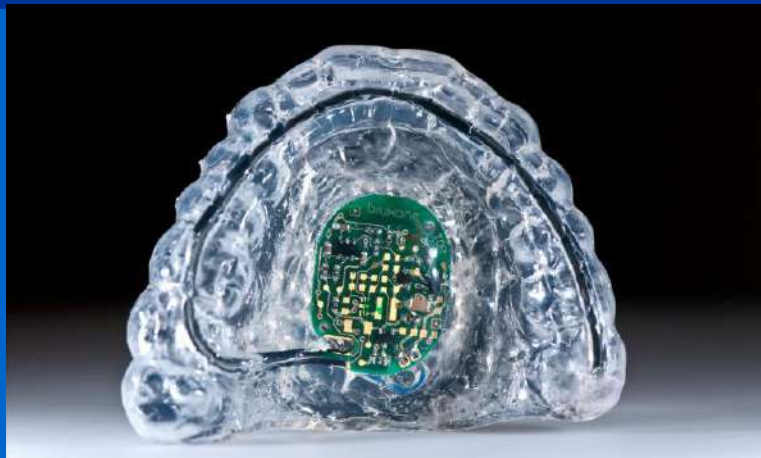
**Effects of Botulinum Toxin on Jaw Motor Events during Sleep in Sleep Bruxism Patients: A Polysomnographic Evaluation**

Young Joo Shim, D.D.S., M.S.D.<sup>1</sup>; Moon Kyu Lee, M.D., Ph.D.<sup>2</sup>; Takafumi Kato, D.D.S., Ph.D.<sup>3</sup>; Hyung Uk Park, D.D.S., M.S.D.<sup>4</sup>; Kyoung Heo, M.D., Ph.D.<sup>5</sup>; Seong Taek Kim, D.D.S., Ph.D.<sup>6</sup>

**Botulinum Toxin reduces the intensity rather than the generation**  
of the contraction in jaw-closing muscles

*Amplitude is smaller, not less SB-RMMA*  
**So the generator remain active**  
**SUGGESTING a Central Origin**

## Example of tooth contact recorder and stimulator (BruXane, EU)



See also P McAuliffe, J Oral Rehab 2015



## Motor evoked potentials (MEPs) & transcranial magnetic stimulation (TMS) – Emerging – not yet for us!



**Abnormal excitability of the central masticatory pathways** in SB patients;  
and indicate that SB **may be mainly under the influence of brainstem networks** rather than that of cortical networks.

*Huang et al, Neurosci Lett 2014*

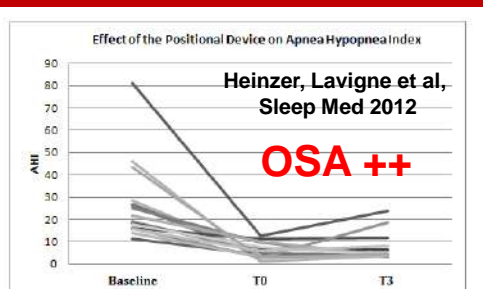
**Off Label**

**Short-term effects (5 days) of repetitive (20 min) transcranial magnetic stimulation** on sleep bruxism  
- a pilot (open) study. [Zhou WN et al](#) [Int J Oral Sci.](#) 2016



**SB subjects tend to sleep on their back/supine position:**  
*Okeson et al 1991, J Cranio Dis; Phillips et al, Chest 1989; Miyawaki et al, Sleep 2003*

**Positional therapy for sleep bruxism? Under trial**

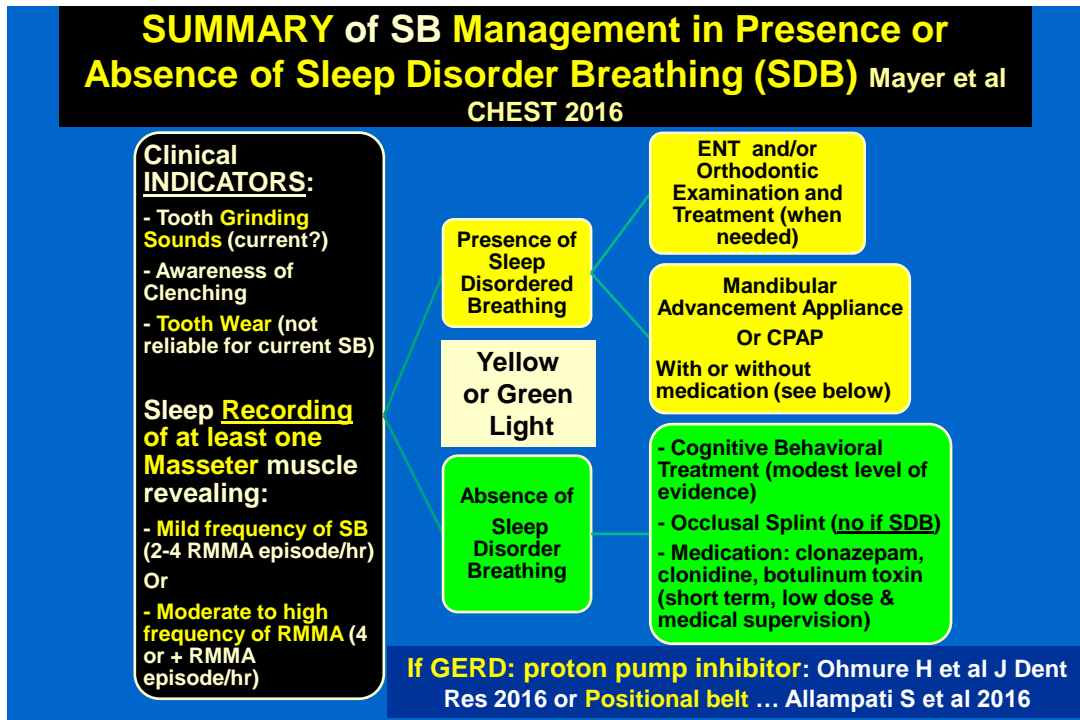


Zzoma Sleep Apnea Device

**Sleep Position Trainer ?**



**IF snoring and bruxism: + effect expected**



## How can we a better understand and perform in dental sleep medicine

- Collect data – large set of data
- Rank their relevance to a given patient condition
- Select best management strategy based on a personalized assessment
- Double check efficacy-safety-risk: efficiency – this:

**based on ongoing-current data :**

**Deep learning / Intelligent algorithm**